AVIATION WEEK

A McGRAW-HILL PUBLICATION

JAN. 2, 1950

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ORDINARY heated propeller shoes are put out of commission if any part of the shoe is damaged. And the outer section is subject to a lot more wear and tear than the inner section. That's because of the greater abrasive action of this faster travelling area. Airline maintenance men were unhappy about discarding shoes when the inner sections looked good as new.

American Airlines thought there should be a way to make the shoe in two sections, so they brought the problem to B. F. Goodrich. Engineers from both companies studied the problem. They found that the special BFG method of making heated rubber equipment made possible a unique way of putting shoes together in two sections.

With the new shoes, if the outer section is damaged, there isn't even a temporary stoppage of the heating element in the vital inner shoe section. Replacement is necessary only for the damaged outer section. Tests indicate that the inner section will outwear two or even three of the outer pieces, just as a coat outwears two pairs of pants in a man's suit. This means a big savings in replacement costs.

And of course the new shoe has all the advantages of BFG electric rubber: highest efficiency, light weight, simple design, flexibility.

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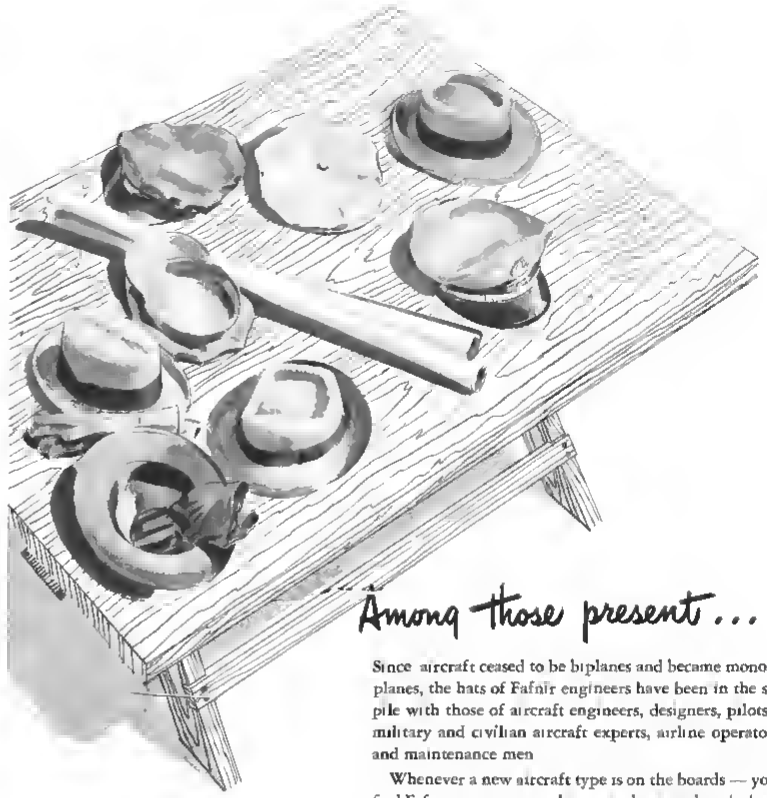

● Fafnir Pipe Seal Ball Bearings

The standard sealed ball bearings fully meet Air Force and Navy Anil Friction Control Bearings Specifications AN 8 4b and specifications for NAS pulleys.

Among those present...

Since aircraft ceased to be biplanes and became monoplanes, the hats of Fafnir engineers have been in the same pile with those of aircraft engineers, designers, pilots, military and civilian aircraft experts, airline operators, and maintenance men.

Whenever a new aircraft type is on the boards — you'll find Fafnir engineers working mind-to-mind with the industry to make certain that every control will function smoothly, not only for the test flight, but for years after. These engineers are present for a very important reason —

It's a reason that you might call "an attitude and an aptitude . . . a way of looking at ball bearings from where you're sitting . . . and an aptitude for doing just what you'd like done about it. That's how Fafnir Ball Bearings came to fly more hours on more types of aircraft than any other ball bearings. The Fafnir Bearing Company, New Britain, Conn.

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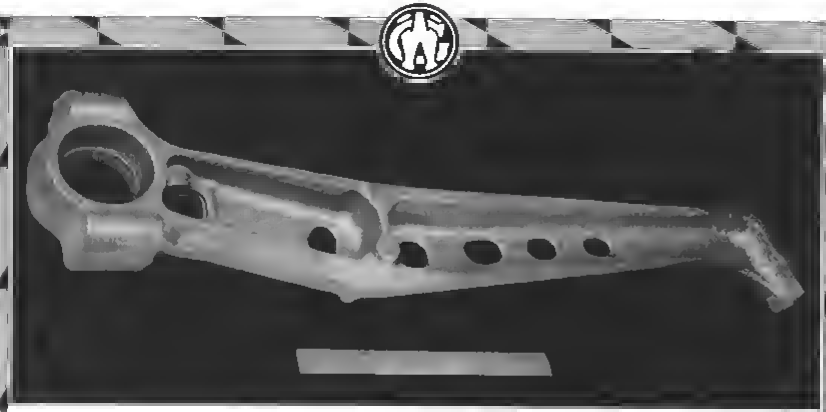

Another typical aircraft forging by Wyman-Gordon — with an over-all measurement of more than 45" this intricate alloy steel forging is a vital wing support for a modern military bomber. For applications of such importance the best technique known in forging practice is essential, assuring scale-free surfaces, close dimensional tolerances, uniform minimum weight and maximum strength — There is no substitute for Wyman-Gordon experience.

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WHO'S WHERE

Changes

► **New Appointments**—Horte M Agey, former publicity director of National Airlines, has become director of publicity for the City of Miami Flight Equipment and Engineering Corp has appointed Gordon Mc granath sales manager, with headquarters at the factory in Miami, Fla **William R Hopkins** has been named director of engineering in charge of all engineering and development activities for Airborne Accessories Corp

Mrs Patricia O'Malley Strickland, has rejoined TWA in a public relations capacity in Washington She resigned three years ago

Brig Gen. William T Thurman has been advanced to general counsel of the Department of the Air Force, from his former post as associate general counsel He succeeds **Brackley Shaw** former general counsel, who resigned to enter private law practice **Bruce F Grimm, Jr,** has been made manager of engineering with the G M Giannini Co, Inc, of Pasadena. **Russell G Robinson,** formerly an assistant director for research at NACA is now assistant director of the Ames Aeronautical Lab

G J Brandewiede, materials director of American Airlines, was named vice president-maintenance and supply, a new department in the carrier's organization

Marvin Whitlock, assistant director of engineering at the airline's Tulsa overhaul base becomes assistant vp of the department, in charge of the Tulsa operation Westinghouse Electric Corp has appointed **C Swan Weber** manager of its Eastern district, with headquarters in New York

► **Canadair Switches**—Everett B Schaefer, formerly with Boeing Aircraft Co, has joined Canadair Ltd, Montreal, as chief technical engineer **William B O'Neal** is now chief of design section He formerly was with Glenn L Martin Co **T J Emmett,** vice president has joined Ford Motor Co of Canada and will retain his present position as officer and director of Canadair

Elections and Honors

► **New Board Member**—Capt Ralph S Barnaby, USN (Ret), has been elected to the board of directors of The Carburetor Corp, Mineola, N Y

► **Extra Jobs**—Raymond G Lochiel, vp-treasurer of Capital Airlines, has been named a member of the civilian panel which gives advice and guidance to the Comptroller of the Army Appointment was made by Army Comptroller Lt. Gen. Raymond S McLain; **Robert Ramspeck** ATA's executive vp was elected president of the National Capital Force of the American Public Relations Assn

INDUSTRY OBSERVER

► **Experimental air towing of helicopters by fixed wing planes, accomplished at Wright Field with Sikorsky and Piasecki helicopters is expected to be incorporated into the new air rescue procedures for larger helicopters to extend range beyond what they could achieve with their own fuel capacity. However, the larger helicopters with auxiliary fuel tanks have ranges far beyond that of today's operational rotocraft. The new Sikorsky H-19 with a normal range of 300 miles, can extend that to 1000 miles with auxiliary tanks, and its structure is designed for towing stresses.**

► Northwest Airlines has run a 1500 hr flight test in airline operation with a Pratt & Whitney R-2000-2SD13G engine in a DC-4 with CAA and P&W cooperation Dynamometer tests on the engine after the long operation showed it developed better than normal rated power, in various throttle and manifold pressure settings Test is in line with discussion between CAA and airlines about lengthening the time between overhauls to more than 1000 hours. Additional tests are expected before any overhaul intervals are changed

► **Manufacturers of small propellers look for some demand for full-feathering propellers to be generated by the new trend toward small twin-engine planes Improvements in single-engine performance with a feathered "dead-prop" in event an engine quits are quite enough to make the additional investment worthwhile.**

► Problem of adapting Goodyear crosswind landing wheels to landing gear struts of many of today's lightplanes has been a factor in delayed acceptance of the wheels. Adapting of the wheels to Cessna gear struts is relatively simple, but Stinson, Luscombe 8A and Aeronca Models 7 and 15 require removal of their struts from the planes to install the crosswind wheels To overcome this difficulty, program of exchange struts has been recommended by Goodyear to its distributors

► **Cobell Industries Inc**, Ft Worth, has sold 16 Grumman TBM torpedo bombers, and three North American SNJ trainers to the Uruguay navy, and is negotiating another contract for sale of 12 Grumman F6F fighters All the planes are war surplus types, reconditioned by Cobell and tested to U S. Navy requirements before delivery to Uruguay.

► New type wheel skis being introduced by Federal Aircraft Works Minneapolis, for two and four-place lightplanes, attach to existing landing gear Cockpit control, which hydraulically raises or lowers the ski on the gear, lets the pilot make wheel or ski landings as he chooses, depending on the surface where he is landing

► **Scott Aviation Corp has a new demand-diluter fixed oxygen mask designed to mix air with oxygen, and with an automatic cutoff warning when the oxygen supply is exhausted or fails At 30,000 ft the system goes on 10 percent oxygen.**

► TWA's President Ralph Damon is nudging Lockheed to speed up delivery schedules on the 20 new Constellations ordered for the airline, first of which are now slated for delivery early next spring, and the last Jan 1951

► **Squadron Leader W A Waterton, Gloster Aircraft test pilot, has flown to Canada to make first test flights on the new A. V. Roe Canada Ltd twin-jet XC-100 night fighter scheduled early in January Plane has been redesignated CF-100 by RCAF, meaning Canada fighter 100.**

► Commonwealth Aircraft Corp (Australia) will start construction of its first prototype jet all-weather fighter, closely resembling the Lockheed XI 90, next summer, following approval by the Australian Minister for Air, and allocation of 500,000 Australian pounds to cover cost of design study and development to prototype stage

► **British Overseas Airways Corp, has announced it will not use the Tudor freighters that are being converted by the British Ministry of Civil Aviation.**

► A new French run-jet research plane, the LeDuc 02 0 developed from the piggy back LeDuc 01 0 is now under construction at Argentuil The 01-0 has been launched from pylons on the back of a four engine SE 161 Languedoc, usually from an altitude of around 17,000 ft in order to attain sufficient speed to operate the thermal duct efficiently. The two place 01 0 has attained a level speed of 570 mph with only half power at altitude.

Bendix-Skinner

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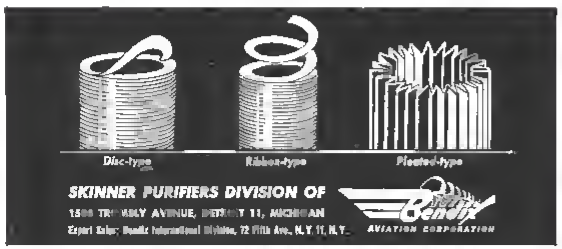
Results Prove It

the *Finest*

Name in Filtering

Whenever there can be no uncertainty about fineness of filtration, rate of flow or filter collapse, ***Bendix-Skinner*** gets the call. In fact, ***Bendix-Skinner*** has been handling the hardest jobs for over twenty years. From this experience have come new and exclusive filtering techniques that assure better performance on any job, *nine times out of ten*. Write for details of the filters backed by Bendix and built by Skinner.

Over 350 Models providing filtration from ½ micron (.000019") upwards at flow rates from 1 to 5000 g. p. m.



AVIATION CALENDAR

Jan. 9-13—Annual meeting and engineering display, Society of Automotive Engineers, Hotel Book-Cadillac, Detroit

Jan. 10-27—Fourth annual Air Transportation Institute, conducted by American University in cooperation with CAA and ATA, Washington, D. C.

Jan. 13-15—All American Air Maneuvers, Miami

Jan. 16-17—Miami-Havana Air Cruise for private planes, conducted by Florida Air Pilots' Assn.

Jan. 16-19—Plant Maintenance Show, sponsored by American Society of Mechanical Engineers and the Society for the Advancement of Management, Cleveland Auditorium, Cleveland

Jan. 17—38th annual dinner of the Traffic Club of Philadelphia, Benjamin Franklin Hotel, Philadelphia

Jan. 17-19—University of Illinois second annual Custom Spray Operators school, Urbana, Ill.

Jan. 23—IAS annual Honors Night dinner, Hotel Astor, New York, N. Y.

Jan. 23-26—IAS 18th annual meeting, technical sessions, Hotel Astor, New York, N. Y.

Jan. 24—Ninth session, ICAO Council, Montreal

Feb. 18-26—National Sportsmen's Show, Grand Central Palace, New York, N. Y.

Feb. 27-Mar. 3—Spring meeting, American Society for Testing Materials, Hotel William Penn, Pittsburgh

Mar. 6-9—47th annual meeting, American Road Builders' Assn., Netherlands Plaza Hotel, Cincinnati

Mar. 24—Fifth annual flight propulsion meeting sponsored by the Institute of the Aeronautical Sciences, Carter Hotel, Cleveland

Mar. 28-31—National Plastics Exposition, sponsored by Society of the Plastics Industry, Navy Pier, Chicago

Apr. 4-6—Engineering and Maintenance conference, Air Transport Assn., Hotel Continental, Kansas City

Apr. 4-8—National Production Exposition, sponsored by the Chicago Technical Societies Council, Stevens Hotel, Chicago

Apr. 16-20—Annual business meeting, American Assn. of Airport Executives, Neil House Hotel, Columbus, Ohio

Apr. 17-19—1950 aeronautic meeting, Society of Automotive Engineers, Hotel Statler, New York City

May 5-6—Midwestern conference on fluid dynamics and the national meeting of the American Physical Society, fluid dynamics division, University of Illinois, Urbana

June 26-30—53rd annual meeting, American Society for Testing Materials, ninth exhibit of testing apparatus and related equipment, Chalfonte-Haddon Hall, Atlantic City, N. J.

PICTURE CREDITS

12—Convair. 13—Dept. of Defense. 14—Bell Aircraft Corp. 15—(top) Pitsscid Hallcopter Corp.; (others) Sikorsky Aircraft. 17—(bottom) Bobby G. Dudley. 24—Boeing Airplane Co. 33—(top, left) AA; (top right) UAL; (center) Slick Airways; (bottom left) TWA.

NEWS DIGEST

DOMESTIC

Transcontinental coach service was inaugurated last week by two carriers—American Airlines and Trans World Airline—with each making one flight a day in each direction. American carried 39 passengers on its first westbound flight from Newark; TWA carried 33. American is using 70-passenger DC-4s while TWA uses 60-passenger DC-4s.

Paul H. Griffith, assistant secretary of defense, has been named special assistant to Defense Secretary Louis Johnson on small business matters. Appointment is in line with Public Law 434 which provides the defense secretary shall assist small businesses to participate equitably in furnishing of commodities and services financed with funds appropriated under this act, and shall name a special assistant to take charge.

Goldsboro, N. C. is being considered as a possible site for the Air Force Academy, according to an Air Force spokesman. All proposals for the site were to have been in by Dec. 31.

Fairchild Engine & Airplane Corp. has changed the name of its pilotless plane division, located at Farmingdale, N. Y., to guided missiles division.

Boeing Airplane Co. has cut down its CAPA guided missile unit as a result of Air Force curtailment of funds for the project. Affected personnel have largely been transferred to other company projects.

Frank R. Murray, named to succeed Joe Bergin as Utah state aeronautics director despite sharp protests from many airport operators, has resigned after submitting a 370-page report to the Aeronautics Commission outlining the ills of aviation in the state. No successor has been named, and Commissioner D. H. Whittenburg has stated that "Mr. Bergin is not being considered for the post."

Air Force will undertake an engineering analysis on the Civil Aeronautics Administration DC-3 with cross-wind gear, to determine whether weight can be saved in the design of landing gear through the use of this device. Results of the tests will be made available to industry. CAA has loaned its plane for six months.

Mid-West Airlines has completed establishment of scheduled service over 1200 miles in four Midwestern states, bringing its service to 4800 miles per day. The carrier uses five-place Cessna 190s.

Fred H. Rohr and a group of associates have purchased all assets and business of Rohr Aircraft Corp., Chula Vista, Calif., from the Newport Steel Corp. Purchase price for the firm, a Newport subsidiary for the past four and a half years, was more than $5 million. Current backlog at Rohr amounts to $20 million.

FINANCIAL

Solar Aircraft Co. and subsidiary, the Hubbard Gasket Co., reported total revenues of $12,330,219 for the six months ended Oct. 31, 1949. Net income was $705,422.

Ryan Aeronautical Co. reported sales for 1949 of $15,268,087, largest volume of any postwar year. Net profit after taxes was $346,674. Ryan had $3,186,945 working capital at year's end.

Air Associates, Inc. reported sales of $6,608,276 for the fiscal year ended Sept. 30, 1949. Net profit for the period was $29,159, after federal tax provisions. Corporation has purchased 11,338 shares of its own common stock, now held in the treasury account. Air Associates' assets total $2,507,162.

Aeroquip Corp. reported sales of $6,021,000 for the year ended Sept. 30, 1949. Net earnings totaled $605,787. Aeroquip paid a dividend of 25 cents per common share.

Pioneer Air Lines board of directors declared a 25-cent dividend on out standing common stock, payable Dec. 31 to stockholders of record Dec. 27, 1949.

INTERNATIONAL

U. S. and Yugoslavia have concluded a provisional civil air transport agreement permitting an American carrier to make a traffic stop at Belgrade and permitting a Yugoslav carrier to operate through the U. S. area of control in Germany and Austria. Pact would enable Pan American Airways to activate a shorter link between Western Europe and Turkey. It eventually would allow Yugoslavia to operate a trans-Atlantic route to the U. S. when its plans progress that far.

Dutch and Belgian governments each have placed orders for construction of 150 Closter Meteor jet fighters, with Fokker Aircraft Co. of Amsterdam and Aviolanda Papendrecht, the Netherlands. Rolls Royce Derwent engines will be built in Belgium.

Canada plans to spend about $10 million this year improving airports and runways, with largest expenditure planned at Gander, Newfoundland, where $3,770,000 is to be spent.

The Standard of the Industry

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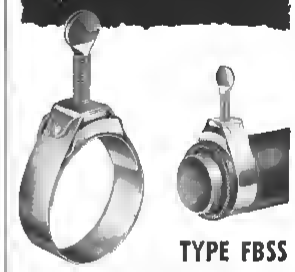

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Utilizing the basic Wittek Floating Bridge . . . this type has been tested and proven through over ten years of dependable service on all types of aircraft applications.

TYPE WWD

Pioneered in stainless steel construction by Wittek for greater strength and dependability . . . this type is available in all standard aircraft sizes, also in large diameters from 4" to 12" for ducts and special applications.

Wittek Aviation Hose Clamps meet current AN specifications and have C.A.A. approval.

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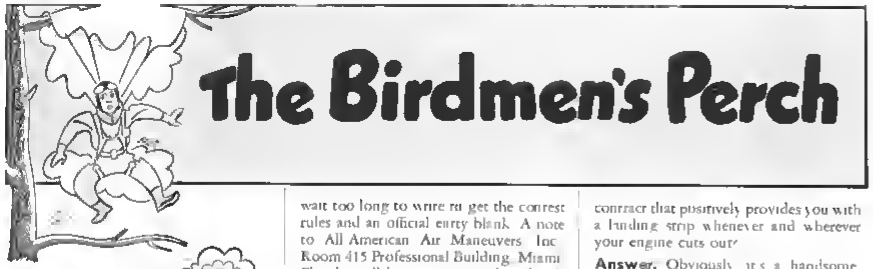

WHO WILL BE 1950 AEROBATIC CHAMPION?

S C Huffman General Manager of the All-American Air Maneuvers expects nearly two dozen of the nation s top aerobatic flyers to compete for the Gulf National Aerobatic Championship Trophy

This means that last year s 1st place winners—Bevo Howard and Betty Skelton—will find a qualified field of entrants shooting at the titles they now hold

The Gulf sponsored contest is open to all—both men and women—on an even basis with no restriction on the type or make of plane used Qualifying trials will be held at Miami January 10 to 12 The top *ten* point scorers will compete for the title and prizes at the Maneuvers (January 13 15)

A purse of $3 500—to be split $1,750 for 1st place, $875 for 2nd place $525 for 3rd place and $350 for 4th place—awaits the winners Judging will be handled by well-known former aerobatic aces

The way things are shaping up it looks like the best contest ever Want to get in? Well there s still time but better not wait too long to write in get the contest rules and an official entry blank A note to All American Air Maneuvers Inc Room 415 Professional Building Miami Florida, will bring you complete details by return mail

HEY . . .

Do you know that water is wet? That night follows day? That 1 and 1 add up to 2?

You do? Well then, here s another fact equally obvious to bright pilots rings and valves remain free longer. time between overhaul periods can be greatly extended and engine lubrication is more even and more efficient when you use Gulfpride Aviation Oil—Series D!

Why because? Because Gulfpride Aviation Oil—Series D—the world s finest detergent dispersant oil for horizontally opposed engines is the only aviation oil purified through Gulf s exclusive Alchlor process This is the super important process that removes extra carbon and sludge formers!

LITTLE KNOWN FACTS DEPT.

Question: What s better than inheriting a quadrillion dollars the key to a Sultan s harem and being blessed with a spiritual contract that positively provides you with a landing strip whenever and wherever your engine cuts out?

Answer. Obviously it s a handsome covered engraved-type commission as Perch Pilot

This fact—with proof—earned a Perch Pilot commission (br) for William E Wood of Hudson, Mass

"A Beechcraft Bonanza could cruise continuously for over 2½ days on an equal amount of fuel as that consumed by the X1 in 2½ minutes!

See—it s as simple as flying into a mountain peak in a fog You enter Perch Pilot potentials who are spending your days in obscurity rush your LKFS—with Proof—to Gulf Aviation Department, Gulf Bldg Pittsburgh 30, Pa

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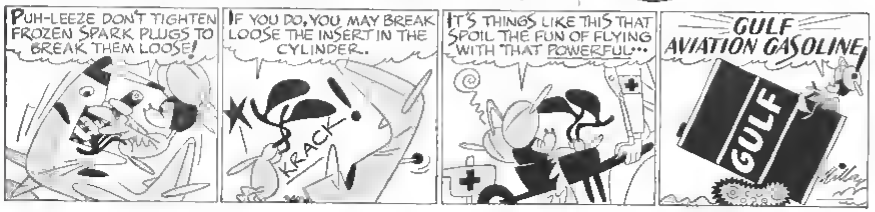
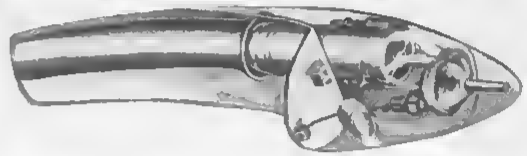
GULF AVIATION PRODUCTS



TURBOPROP ENGINES, sketched on photo of typical Convair-Liner are power packages forward and above heavy black lines.

Convair Ready to Convert to Turboprop

Could have Liner with new power flying eight months from start.



T 38 NACELLE would have engine air intakes on sides oil cooler intake below

(This is the second of a series of articles on U S jet transport development problems These articles were prepared by AVIATION WEEK *Editor Robert H Wood and News Editor Robert Hotz after interviewing key executives and engineers of leading Pacific Coast transport manufacturers)*

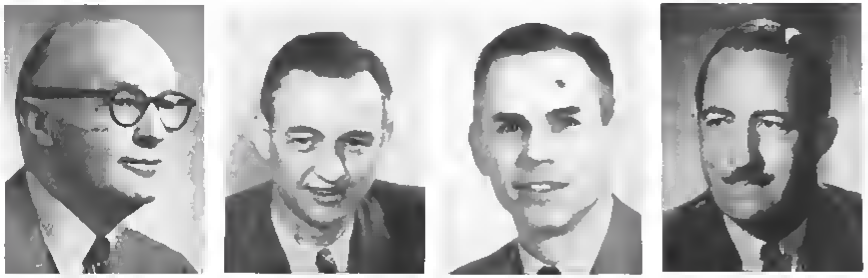
San Diego—Consolidated Vultee Aircraft Corp believes the next significant step in U S transport development will be application of turboprop engines to American airframes now flying with piston powerplants

Convair's board chairman Floyd B Odlum and President LaMotte T Cohu emphasized Convair's hopes for the turboprop airliner in an exclusive statement to AVIATION WEEK, backed by the technical judgment of Convair's two top engineers R C. (Sparky) Sebold director of engineering, and Frank Fink, chief engineer of the San Diego division

▶**Transport Project**—Convair officials make no secret of the fact that the Convair Liner airframe is well suited for immediate adaptation to turboprop power Accompanying sketch shows how Convair engineers envision the Convair Liner powered by two Allison T 38 turboprops rated at 2750 equivalent shaft horsepower The T 38s would replace the Pratt & Whitney R 2800 piston engines rated at 2500 hp that are now in airline use

Seabold estimates Convair could have the prototype turboprop Convair-Liner flying within eight months from the time actual work started on such a project Convair is also trying to interest the U S Air Force in a turboprop-powered version of the T 29A navigational trainer adapted from the Convair Liner airframe

▶**Convair Experience**—Convair engineers have had probably more experience fitting turboprop engines to airframes than any other U S manufacturers Convair pioneered the first



CONVAIR TEAM—Odlum, Fink, Sebold, Cohu—The power plant is the key, but financing is the hurdle.

U S turboprop installation with its wartime development of the XP-81, powered by a General Electric TG-100 turboprop plus a turbojet. Convair is currently installing four Allison XT-40 turboprops (double T-38 units with each pair turning a single set of propellers) in its giant XP5Y-1 radically designed flying boat being built for Navy anti-submarine warfare.

Sebold and Fink estimate that it will take another three years to turn out a mass production model turboprop suitable for regular airline operations. They agree that the pace of future transport development will be dictated almost entirely by engine progress.

▶**Engine Is Key**—"The power plant is the key to transport development," Sebold told AVIATION WEEK. "The airframes we already have are ready to take the power that will be available in the foreseeable future."

Sebold pointed out that the turboprop was the next logical step in transport development since it could be applied to almost all of the transport airframes now in operation and a turboprop powered airliner could use the present airways and traffic control systems.

He also believes that the turboprop airliner will have a permanent place in the transport field over medium hauls even after development of turbojet transports. Sebold and Fink believe that the turbojet transport will find it impossible to compete economically with turboprop airliners over blocks of 500 miles or less.

Sebold and Fink believe that the turboprop Convair Liner offers the following advantages to airline operators:

- **More speed**. The turboprop offers more power at less weight and a substantial increase in block speeds over comparable piston engines.
- **Increased passenger comfort**. The turboprop would eliminate most of the noise and vibration now encountered in piston powered transports.
- **Substantial operational bonus**. Air line operators could take any operational bonus either in increased range or increased payloads depending on the requirements of their specific routes. The T-38 installation on the Convair-Liner would result in a 2000 lb. weight saving over piston engines currently used. This is the equivalent of 10 additional passengers or 350 additional gallons of fuel.

Higher take-off and cruising power offered by the turboprop will also permit operation at higher gross weights than are now possible resulting in an additional weight bonus for more payload or fuel depending on route requirements.

▶**Pressure Required**—Sebold and Fink believe that by the time turboprop airliners go into regular airliner service 500 hr. overhaul intervals will be standard for the engines. Since the turboprop reaches its best cruising efficiency above 20,000 ft. pressurization will be required for all turboprop airliners, the Convair engineers point out. However many present pressurization problems will be simplified by the turboprop engine which eliminates any requirement for an additional supercharger by bleeding air from the engine compressor for cabin pressurization.

▶**Financing Problem**—Financing development of turboprop Convair Liner is a major hurdle still to be overcome. If USAF decides to convert its T-29A trainers to turboprops for high altitude operations, development of the commercial version would be relatively simple financially.

Another possible development, now remote, lies in the pooling of airlines who now operate Convair Liners to co-operate in the turboprop financing that would provide them with more modern equipment at a fraction of the cost of a new plane.

Odlum pointed out that USAF and Navy could aid commercial aviation development by financing experimental projects that were desirable to fill military requirements but which could also be applied commercially.

▶**Odlum Statement**—In regard to financing new transport prototype development, Odlum goes along with the Aircraft Industries Assn. stand for government financial aid to the aircraft industry. However he pointed out that the total equipment requirements of commercial airlines are such that it would be profitable for a manufacturer to supply them if the airlines worked together in determining the types of new equipment they wanted.

"Convair lost nearly $50 million on the approximately 200 Convair-Liners it produced as an advanced twin-engine transport type," Odlum said. "Forgetting that part of this could be attributed to under-pricing at the start, it would still have required orders of the magnitude of 400 planes to have broken even. That quantity is within the capacity of the airlines working together on the types of equipment to be purchased."

▶**Evaluating British Lead**—The present British lead in turboprop and turbojet transport development will have some, but not too much effect on long range competition with U S manufacturers, Odlum believes.

"The British announcement of price and performance tends to slow up potential European purchasers of current American equipment," he said. "Some of them will apparently like to sit back and wait to see what works out.

"The price that has been stated for these European planes is attractive when viewed in terms of currency devaluation and this is more of a factor. The airlines are not yet ready for turbojets. There are many more problems dealing with navigation, economy of operation, loss of time on the ground, and safety in flight, that are all more important than more speed in flight."

In broad terms, looking at Convair's transport future, Odlum says:

"Convair hopes that when better transport planes are built it will build them. Convair however, is in business to make profits for its stockholders and therefore does not expect to commit financial suicide for the sake of making some particular type of plane."

NEW NOSE FOR SABRE

North American designers re-formed the nose of the Sabre, world's fastest service aircraft, to create an all weather fighter version designated F-86D, which recently made its first test flight at Edwards AFB, Muroc, Calif. Purchase of 122 of this version is scheduled in the USAF 1950 procurement interim program. Nose inlet duct is lowered about a foot, in order to put a nose radar installation above it. In addition to the nose changes, the fighter has a new afterburner installation for its GE J-47 turbojet powerplant which nearly doubles the powerplant's thrust for short periods. The D model fuselage is three feet longer and slightly heavier than the F-86A, uses same wings and tail surfaces. It is designed as a fast-climbing all weather fighter for short range high-altitude interception missions. The D model is not to be confused with the still later North American XF-93 also developed from the F-86, which has also arrived at Edwards AFB for tests, and which features flush air inlets along the cockpit and slimmer lines than the original model shows.

PAA Holds Off

Carrier will not start Holy Year flights pending CAB decision.

Pan American Airways has agreed to hold off inauguration of its Felix Roma charter flights to Rome until the Civil Aeronautics Board decides whether a request to perform daily flights for four months constitutes charter or scheduled service.

The carrier's wait-and-see attitude came out at hearings in U.S. District Court in New York, where Trans World Airline filed suit for an injunction (AVIATION WEEK, Dec. 26) which would permanently restrain PAA from flying between the U. S. and Rome. In view of PAA's decision, the court took no action on the request for the injunction.

▶**Now Up To Board**—TWA has filed a brief with CAB asking for dismissal of PAA's proposal to operate the regular charter flights.

Previously, the Board gave PAA permission to operate eight flights a month from January to May and from October to December. PAA then requested permission to operate daily flights in the interim—from July to September—and has indicated that it will not follow through with twice-a-week flights if its request to provide daily service is denied.

Both TWA and American Overseas Airlines have complained to CAB against the Board's recent policy statement permitting trans-Atlantic group charter flights by PAA and possibly other carriers during 1950. (Steamship companies reportedly are considering a protest to the Maritime Commission with regard to reduced-rate air competition.)

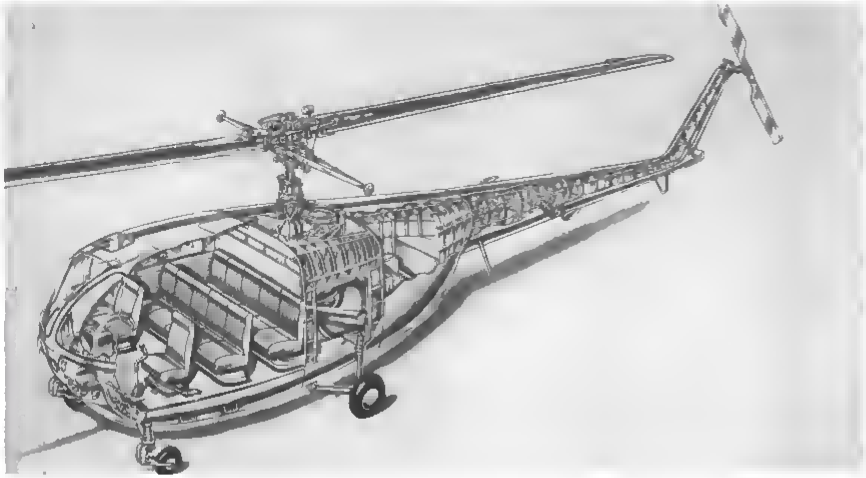
▶**Arguments**—AOA said CAB's program subverts the purposes of the Civil Aeronautics Act and invites wholesale disregard of the trans-Atlantic route structure. CAB first advised the certificated trans-Atlantic flag carriers that lower on-season (summer) fares on regularly scheduled flights would not be permitted in 1950 but then turned around and favored cut-rate group charter operations by both certificated and irregular lines, AOA declared.

TWA's protest was even more bitter. Like American Overseas, TWA pointed out that it had thousands of empty seats in 1949—even during the summer—and expected to increase its capacity in 1950.

Describing the PAA charter exemption as illegal, TWA said the Board's procedure in granting special operating authority without hearings didn't meet the standards of fair play.

"History has established that PAA never gives up in its relentless effort to increase its dominance and eventually gain monopoly in international transportation," TWA declared. "The Holy Year subterfuge is the most vicious piece of strategy yet devised by PAA in its effort to reach its ultimate goal."

▶**PAA's Side**—Pan American charged that TWA's brief was "an attempt by misstatements and false innuendos, to preserve TWA's stranglehold on U S.-Italy air travel, even at the cost of preventing thousands of Americans of Catholic faith from taking advantage of legitimate charter arrangements to make the Holy Year pilgrimage at a price which they can afford to pay."



BELL FEEDER LINER, in passenger version, would carry 12, with cost per-seat on a par with that for large fixed wing planes.

Reveal Details on Transport Helicopters

Bell and Sikorsky get the nod from two New York case applicants.

By Alexander McSurely

Two of the most active applicants in the New York area helicopter service case before CAB have voiced an equipment preference for Sikorsky and Bell helicopters, to operate a proposed network of routes blanketing the New York area as far south as Princeton, N J and as far north as Bridgeport, Conn

In exhibits filed with CAB

• **New York Airways, Inc**, John L Senior, Jr, president, proposes to operate three large Bell Model 48 Feeder liner helicopters and six smaller Sikorsky S 52-2 copters

• **Air Commuting, Inc**, Robert Ducas president, proposes to operate seven large Sikorsky S 55 copters if it covers the area with a cloverleaf route pattern and 11 of the big Sikorskys if an alternate radial route pattern is used

With 10 applicants listed in proceedings, only these two companies have filed extensive exhibits supporting their ability and willingness to undertake the service The Air Commuting exhibit represents a combination of the company with Metropolitan Aviation Corp, under an application now pending before CAB to merge the two organizations

Meanwhile an exhibit filed by the Helicopter Council of AIA with the CAB gives the first detailed descriptions of performance and specifications of the large Bell and Sikorsky commercial helicopters plus similar data on the Piasecki and McDonnell helicopters and on the British Cierva Air Horse, all in the same general size and power category

CARGO-MAIL VERSION of Bell Model 48 Feeder Liner

► **Cost Analysis**—Helicopter Council analysis of purchase costs of these transport-class helicopters, estimated to be from $120,000 to $150,000 per unit, shows that they compare favorably with cost per seat of such fixed wing transports as the Convair 240, Douglas DC 6 Lockheed Constellation and Boeing Stratocruiser

► **Performance and Specifications**—Comparative data on the three large American helicopters now in production in military versions and the fourth (McDonnell) ready for production on order, together with similar information supplied by Cierva on its Air Horse W 11, now flying, and a still larger model in design stage the W-11T, are as follows

• **Bell Model 48 Feeder-Liner** Powered with 800 hp Wright R 1300 engine, carries maximum of 12 persons (11 passengers, 1 pilot) Capable of 200 mi flight with 15 min fuel reserve, with 10 passengers and baggage (1900 lb) plus 207 lb airmail and cargo, 114 gal fuel, pilot and necessary equipment Cruising speed 90 mph at 75 percent power, high speed 110 mph maximum rate of climb, 1260 ft /min fuel consumption 55 gal /hr, gross weight, 7500 lb weight empty, 4268 lb, cabin size 9 ft 8 in by 7 ft 3 in by 4 ft 3 in

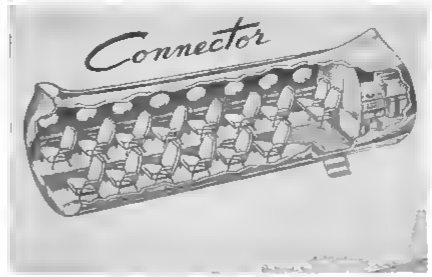
• **Sikorsky S-55.** Powered with 600 hp Pratt & Whitney R-1340 engine (higher unspecified performance with more powerful 800 hp engine) Carries maximum of 10 passengers, crew of 2 Capable of 200 mi flight with 15 min fuel reserve with 8 passengers and baggage (1520 lb plus 272 lb airmail and cargo), 90 gal of fuel, pilot, and necessary equipment Cruising speed, 86 mph, high speed, 103 mph, maximum rate of climb, 1000 ft /min, fuel consumption 36 gal /hr gross weight 6800 lb, weight empty 4000 lb, cabin size 10 ft by 5½ ft by 6 ft

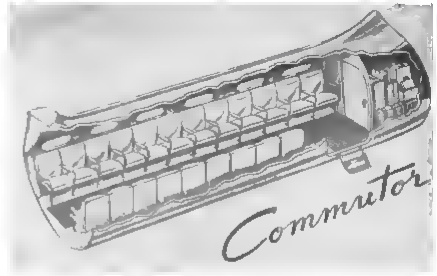
• **Piasecki HRP-2 (commercial).** Powered with 600 hp Pratt & Whitney R-1340 engine (installations of R-1300 or R 1820 engines optional without major structural modification) in three versions will carry 11, 15 or 21 passengers plus crew of 2 Capable of 150 mi flight with 30 min reserve with 11 passengers plus 330 lb baggage, or 100 mi flight with 15 min reserve with 15 passengers and 450 lb baggage, or 75 mi flight with 15 min reserve with 21 passengers and no baggage. Cruising speed, 104 mph, high speed, 135 mph, maximum rate of climb, 1600 ft /min, fuel consumption, not given, gross weight, 11,500 lb, weight empty, 7000 lb, basic weight, including equipment and fuel, 7879 lb to 8102 lb; cabin size, 20 ft by 6 ft by 5 ft 6 in

• **McDonnell 65-C** Powered with two Wright 700 hp engines Carries maximum of 12 passengers, plus crew of two Capable of 470 mi flight (max. range) with 12 passengers and 480 lb baggage; or capable of 200 mi. flight with 15 min reserve with 3859 lb of airmail and cargo, or 100 mi flight with 15 min reserve with 4227 lb airmail and cargo (space limitation prevents additional passenger load). Cruising speed, 87 mph; high speed 117 mph, maximum rate of climb, 1500 ft /min; fuel consumption, cruising, 51.2 gal /hr, gross weight, 15,000 lb., weight empty, 9811 lb; cabin size, 12 ft by 6 ft 4 in by 6 ft 7 in

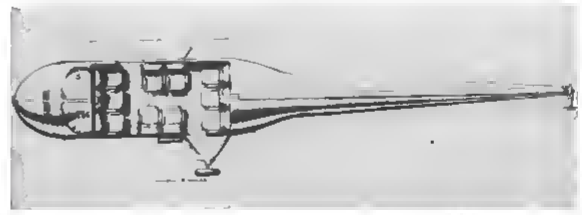
• **Cierva Air Horse W 11** Powered with Rolls Royce 1620 hp engine Carries maximum of 24 passengers and crew of two Capable of 200 mi flight with 15 min reserve with 20 passengers and 35 lbs baggage or 100 mi flight with 15 min reserve, with 20 passengers and 487 lbs. baggage or cargo. Cruising speed, 116 mph, high speed, 140 mph.; maximum rate of climb, 1210 ft /min.; gross weight 17,500 lb, weight empty, 12,135 lb, cabin size, 19 ft by 7 ft 6 in by 5 ft 8 in; fuel consumption 4.03 lb /mi

• **Cierva Air Horse W-11T** Design study not in flight stage Powered with two Rolls Royce 1620 hp engines Carries maximum of 34 passengers and crew

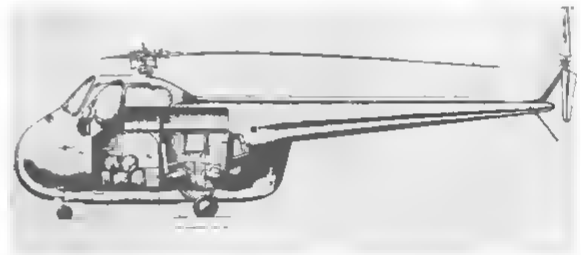




PIASECKI S HRP 2 offers a 15 passenger "Connector" version and a 21 passenger "Commutor" version to cruise at 104 mph.



SIKORSKY S-55 would carry a crew of two and ten passengers in this no-cargo version



WITH CARGO compartment, the S 55 would carry crew of two and six passengers

Cost Analysis

	No. Passengers	Price	Initial Investment Per Passenger Seat
10-Place Helicopter	10	$120,000—150,000	$12,000—15,000
Convair 240	40	500,000	12,500
Douglas DC 6	60	900 000	15,000
Lockheed Constellation	60	1,000 000	16,667
Boeing Stratocruiser	75	1,500,000	20,000

of 2. Capable of 200 mi. flight with 15 min. reserve with 34 passengers and 1020 lb. baggage, or 100 mi flight with 34 passengers and 1638 lb baggage and cargo. Cruising speed, 116 mph., high speed, 140 mph., maximum rate of climb, not given, gross weight, 25,000 lb., weight empty, 15,400 lb., cabin size, 22 ft. by 8 ft. by 6 ft. 6 in.; fuel consumption, 4 85 lb./mi.

►**Need for Service**—Need for opening of helicopter service in the New York area is pointed out by the Port of New York Authority in an exhibit filed with CAB last week.

Of 12 million residents in the area, approximately 5 million reside outside New York City proper. In 1948 over 287 million persons were transported into New York from commuter areas around the city.

The Authority points out that while it is not contemplated that the helicopter service can at this time be any substantial assistance in handling the huge traffic volumes in the area, if only a minute fraction of the traffic is moved more efficiently the service will be worthwhile.

Exhibits by the applicants and the Port Authority present detailed estimates of time savings and volume possible through helicopter airmail service, and benefits from passenger and cargo service.

Contemplated generally are an inter-airport helicopter limousine service to enable airline passengers deplaning at any New York airport to make quick connections with a plane at some other New York airport, a skybus commuter service between surrounding small communities and New York, and an airport to downtown-Manhattan service.

Aircraft Industry Is Among Top Twenty

Aircraft manufacturing industry delivered 34 6 million pounds of military and civil airframes during 1949, according to a joint official estimate of the office of Domestic Commerce and the Civil Aeronautics Administration. Figure indicates a continuation of trend towards increased output since 1947.

Dollar value of all shipments by airframe, engine and propeller companies in 1949 is estimated at $1700 million, an increase of $250 million over 1948. This output ranks the aircraft industry between 15 20th among all U. S. industries, well down from its 1944 position of first but considerably improved over its 1939 ranking of 44th.

Military production continued to lead by an increasing margin with 1949 production being 81 percent military by airframe weight and 82 percent by estimated dollar value. The remainder of production was made up of about 165 civil transports and 3400 personal aircraft. Reflecting the substantial difference in average airframe weight, these transports aggregate 4 million airframe pounds while the personal aircraft represent only 2 5 million airframe pounds. This is the third consecutive year that personal aircraft production has declined, 1949 output was only 10 percent that of 1946.

Department of Commerce estimates continued increase in aircraft production during 1950, figuring $1 8 billion in total output, of 36 41 million pounds airframe weight, including 145 civil transports and about 3000 personal aircraft.

Tulley Named Head Of Research Group

Arthur H. Tulley, Jr., has been elected executive director of the Aeronautical Research Foundation, replacing Lynn L. Bollinger, who relinquished the post to devote full time to other responsibilities, including development of the Kippen-Bollinger Helioplane.

Tulley, assistant director of research at the Harvard Business School, was co-author with Bollinger of "Personal Aircarft Business at Airports," and formerly Massachusetts director of aeronautics.

Bollinger continues as a trustee of the Aeronautical Research Foundation, a nonprofit organization composed of Harvard and Massachusetts Institute of Technology faculty members and prominent Boston citizens. ARF research on the external noise factors deterring community acceptance of personal airplanes has been completed, with analysis of data to be submitted shortly in a final report to the National Advisory Committee for Aeronautics.

First Performance Figures for Comet

First official performance figures for the de Havilland Comet, released after four months of extensive flight and ground tests, indicate the British jet transport has a cruising speed of 490 mph., gross weight of 105,000 lb., and a still air range of 3540 statute miles.

Company officials say practical range of the 36 passenger craft, with 12,000-lb. payload, is 2645 miles, representing a "stage length" of 2140 miles, plus 200 miles diversion allowance, against a headwind of 50 mph. By reducing payload to 6000 lb., practical range is 3000 miles.

A 48 passenger version, under consideration for shorter hauls, can carry a 14,000-lb. payload 1750 miles plus 200 miles diversion allowance, against a 50 mph. headwind.

AEROCAR DISPLAYS NEAT LINES

M. B. Taylor stands beside his novel Aerocar three-seat convertible plane-auto now undergoing tests for CAA approval. It's stated that stability has proved satisfactory in initial trials. Still unsettled is CAA decision on necessary strength requirements in light of dual purpose use. Craft has 100-hp. Franklin driving tail-mounted pusher prop.

Miami Races

Small racers, stunters are slated as stars reject course change.

Third annual Continental Motors trophy midget plane race, and the Gulf Oil-sponsored national acrobatic championship competition will be principal events of the 1950 Miami (Fla.) All American Air Maneuvers opening Jan. 13 at Opa Locka airport for three days.

An air cruise in which more than 150 planes are expected to participate will leave Miami early Jan. 16 for a visit to Havana, returning Jan. 18.

Continental race will use the same two-mile four-pylon rectangular closed course in front of the grandstand as in 1949. A proposed six-pylon course was abandoned after it was found that part of the course crossed high tension wires. Steve Wittman, Oshkosh, Wis., and his racing partner Bill Brennand, winners of the two previous Continental races, are expected to be in the 1950 competition with their Wittman Specials.

Continental race will be limited to the 18 fastest qualifying planes. Three elimination heats of eight laps (16 mi.) will be run on Friday, Jan. 13, two semi-finals of 10 laps, Saturday, and a 12-lap final race of the best eight planes from the semi-finals, Sunday.

Beverly Howard, Charleston, S. C., three times winner of the acrobatic title, is expected to defend his title, while Betty Skelton, Tampa, 1949 women's champion will compete this year in the open national championship contest.

First military exhibition flying under the new Defense Department limitations will include an F-80 Shooting Star team of Florida Air National Guard pilots, the Rockets.

Other service participation will include a dive-bombing exhibit by F-80s from Selfridge AFB, Michigan; a flyover of a B-29 squadron; a dive-bombing exhibit by Navy AD-1 Skyraiders, acrobatics by a Marine jet F9J fighter, and a flyover of Naval Air Reserves in Grumman F6Fs and Chance Vought F4Us.

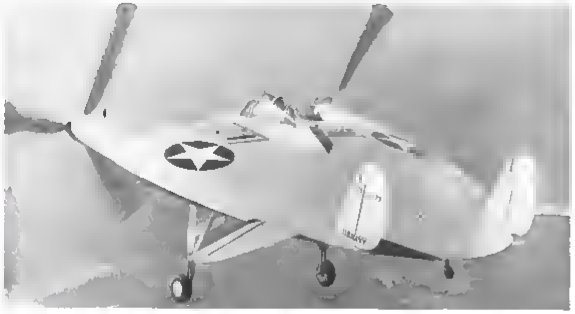
Preparations are being made at three airports in the Miami area: Tamiami, Sunny South, and Opa Locka, to accommodate 1500 private planes expected in January at Miami.

Regular meeting of the Personal Aircraft Council planned to coincide with the air maneuvers has been postponed to February 9 in Washington, but most of the personal aircraft manufacturers who are members of the council are expected to be in Miami for a preparatory unofficial session.

MIAMI AIR RACE HOPEFUL is novel pusher Dragontail midget being readied by . . .

. . . Designer Paul M. Schroeder (in cockpit) who reports that his plane has 220-mph. top speed using buried Continental driving extension shaft to prop mounted behind tail.

MIDGET RACER built by McDonnell employes is of similar layout, but is made of wood.



FLYING MODEL embodying Zimmerman's ideas was V 173, which later evolved into

XF5U-1, Navy fighter, also built by Chance Vought, to do 500 mph and slow almost to a standstill in midair. Craft was not flown because of contract cancellation after war.

Case for a Convertible Aircraft

Cruising performance and economy of low-aspect-ratio configuration can approach those of conventional craft.

By Charles H. Zimmerman*

On the basis of considerable study and experimental data from wind tunnel and full scale flight tests, it now appears possible to build a low aspect-ratio convertible aircraft that will approach the conventional plane in cruising speed and economy yet take off and land as a helicopter.

And it is evident that the success of such a design depends, greatly on good engineering, for the penalties attached to excess weight, lack of aerodynamic cleanness, and poor compromises are severe.

▶ **Convertibles Classified**—Convertible aircraft can be divided into two general classes—those using a helicopter rotor as an auxiliary device operative for sustentation at low speeds and inoperative at high speeds, and those using the same rotor for both sustentation at low speeds and propulsive thrust at high speeds.

In this latter case the rotor axis swings through an angle of approximately 90 deg. in going from hovering to high speed forward flight. Two general schemes have been proposed to effect this change in rotor axis angle. In one case, orientation of the rotor relative to the aircraft is changed, in the other case the entire craft is rotated. We deal here with a convertible aircraft of this latter type which has been the subject of a considerable amount of theoretical and experimental study.

Fig. 1 shows principal features of this convertible aircraft. It comprises an airfoil of very low aspect ratio (serving also as the fuselage), two large, counterrotating, tractor propellers or rotors, and vertical and horizontal tail surfaces.

▶ **Hovering, Takeoff, Landing**—For a craft of this type to take off and land as a copter, it must have a landing gear capable of supporting it with the thrust axis nearly vertical. The gear also should accommodate airplane type landings and must be capable of retraction for good cruising and high speed performance.

Trailing edge of the airfoil is really a large flap serving a variety of purposes. Its primary function is to produce longitudinal trim near the ground. Without its deflection, the craft will pitch forward, because of aerodynamic interference effects between the ground and trailing edge when near the ground. Deflection of the flap permits a considerable reduction in landing gear length over that otherwise necessary. It can be used for longitudinal trim in forward flight or be used as a spring loaded stabilizing flap permitting further aft c.g. locations than otherwise possible.

When hovering, this convertible airplane is a type of rotary wing craft with stability characteristics similar to those of a helicopter. Models which have been flown as copters have been nearly stable longitudinally, but are subject to lateral oscillation which can be damped readily by rudder motion. Longitudinal control when hovering is achieved by deflection of the two horizontal fins, called ailavators, simultaneously, control about the vertical axis by deflection of the ailavators differentially, and control in roll by deflection of the rudders.

▶ **Rotor Considerations**—One of the major questions in the design of a convertible aircraft that is to use the rotors for both sustentation at low speeds and thrust at high speeds is the extent to which high speed and static thrust must be compromised as compared with the performance of a copter rotor on one hand and a conventional airplane propeller on the other. Ability of a rotor or propeller to produce static thrust is given by

$$T = (33.7 \times \eta_p \times \mathrm{Hp} \times D)^{2/3}$$

where T is static thrust, η_p, ratio of power input to kinetic energy per unit time in the downward component of slipstream, hp, horsepower input to rotor, and D, propeller diameter.

This well-known relationship states that to support a given weight with a given horsepower, there is a minimum rotor diameter which is dependent on the factor η_p. This factor will ordinarily

* Aeronautical Research Scientist, National Advisory Committee for Aeronautics. Views and opinions expressed here are based on independent work of the author and in no way reflect views of NACA.

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EL SEGUNDO PLANT OF

DOUGLAS

fall between 0.65 and 0.80 for both helicopter rotors and aircraft propellers at their most efficient blade angle if the tip speed is below Mach 0.8.

Fig. 2 shows a variation of static thrust efficiency with blade angle for a four blade, convertible aircraft rotor designed for maximum efficiency as a propeller at a forward speed of 500 mph.

These data, taken from tests in the full scale tunnel at NACA Langley Lab,[1] indicate that blade planforms and twist distributions satisfactory for high speeds also give good values of η_s for the static thrust condition.

Selection of rotor design characteristics from the standpoint of hovering performance therefore resolves itself into choosing the largest diameter which can be used without too seriously sacrificing transition and high-speed characteristics.

▶**Transition**—For the aircraft under consideration, transition from hovering to high speed flight involves gradual rotation of the entire aircraft in pitch from nearly 90 deg to the horizontal to the small angle of attack required for the airfoil to support the weight at high forward speeds. Returning to hovering flight involves the reverse process. For this to be accomplished satisfactorily, there should be no sudden changes in power or control settings required to maintain level flight and no pronounced instability.

The craft must remain controllable and preferably the controls should give motion in the same sense about the same body axes at all speeds.

It is obviously desirable that the power required in the transition range be not greater at any speed than that required for hovering.

Longitudinal trim must be possible at any speed.

The rotors must not flap excessively or be subjected to excessive stresses.

▶**Tunnel Tests**—The NACA has made wind tunnel tests on a model of a convertible-type aircraft over the range of attitudes and powers of interest in transition from hovering to high speed flight. Results have been published in two reports.[2,3]

This model differed from the true convertible in that the aircraft it simulated was designed primarily for high speed and had insufficient rotor diameter for hovering or for flight at speeds less than 50 mph. with the maximum power and minimum flying weight.

Fig. 3 shows an outline three-view sketch of this craft. The measured performance, stability, and control characteristics give indications of the behavior to be expected of the true convertible of the same type.

▶**Performance Estimation**—In making performance studies for this type of convertible, it was evident soon after the first conception of the craft in 1933 that an analytical procedure was needed for estimating performance in the transition range. A crude approximation method was developed in '36 and '37 based on these assumptions:

- Effects of twist and nonuniformities in the slipstream velocity distribution were neglected.
- Propellers were assumed to convert 70 percent of engine power into increase in momentum of the air passing through the propeller disk, the air passing through the disk being assumed to have the velocity $(v/2 + V \cos \alpha)$, where v is the increment of velocity added and V the flight velocity.
- Increment of velocity v was assumed to be parallel to the propeller axes of rotation and to add vectorially to the flight velocity to give the final slipstream velocity.
- Forces on airfoil were assumed to be the same as if the airfoil were in a free stream having the direction and velocity of the slipstreams.
- Wing zero lift line was assumed parallel to the propeller rotational axis.

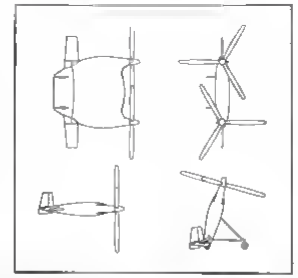


Fig. 1 Various views showing principal features of convertible under consideration

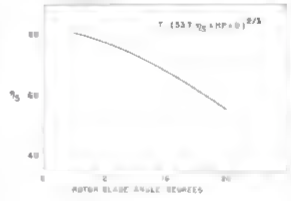


Fig. 2 Static thrust efficiency factor for convertible aircraft rotor

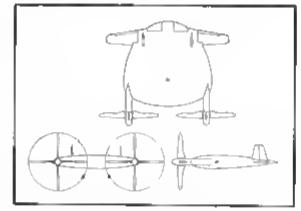


Fig. 3 Three-view aspects of wind tunnel model of convertible-type aircraft

When applied to the aircraft which is the subject of this discussion, these relationships result

$$T = 2\rho \frac{\pi}{4} D^2 \left(V \cos \alpha + \frac{u}{2} \right) u$$

$$\text{Hp} = \frac{2\rho \frac{\pi}{4} D^2 \left(V \cos \alpha + \frac{u}{2} \right)^2 u}{550\,\eta}$$

where T is total thrust of two propellers, hp., total brake horsepower applied to two propellers, η, efficiency with which the brake horsepower is converted into gain in momentum of the air parallel to propeller axis, and D, propeller diameter.

For unaccelerated level flight

$$W = T \sin \alpha + R \cos \theta$$

$$0 = T \cos \alpha - R \sin \theta$$

where R is resultant airfoil force; θ, angle of resultant airfoil force to the vertical $\theta = \alpha - (\alpha'/2)$. Term α' is angle of attack between slipstream and propeller rotational axis

$$\tan \alpha' = \frac{V \sin \alpha}{V \cos \alpha + u}$$

$$V_1 = \frac{V \sin \alpha}{\sin \alpha'}$$

where V_1 is the slipstream velocity.

$$R = \frac{1}{2} \rho V_1^2 S C_R$$

where C_R is resultant force coefficient on airfoil at angle of attack α', S, wing area.

For a wing of the aspect ratio under consideration (1.27),

$$C_R = 2 \tan \alpha'$$

Fig. 4 shows the power required for level flight as indicated by NACA wind-tunnel tests and as given by the approximate method for an assumed value of η of 0.70. As will be seen from the figure, the agreement is better than the crude assumptions warrant indicating the existence of compensating inaccuracies.

▶**Stalling**—This method of estimating performance in the transition range gives a rough indication of the effective angle of attack of the airfoil and therefore of its likelihood of stalling.

Fig. 5 shows the estimated effective angle of attack vs. geometrical angle of attack for two typical cases representing the same aircraft with two different rotor diameters. For the larger rotors, the effective angle of attack reaches a maximum value of 34.5 deg. The more intense slipstreams of the smaller ro-

tors keep the maximum effective angle of attack down to 31 deg.

From this figure, it is obvious that if stalling is to be avoided in a convertible aircraft of this general type, the airfoil must be capable of going to quite high angles of attack, of the order of 35 to 40 deg without stalling. The graph indicates that from the standpoint of airfoil stalling it is advantageous to use smaller rotors, and this is a factor that should be kept in mind in the final selection of rotor diameter.

It is obvious that there is also a lower limit to the rotor diameter below which the slipstream will fail to prevent stalling. The diameter of the rotors of the model which was tested in the Langley full-scale tunnel was set by the consideration that it be unnecessary to synchronize guns mounted on either side of the cockpit. These rotors certainly were near the lower limit in diameter.

It is probable that the relatively high values of measured power required at speeds around 50 to 60 mph (Fig. 4) were due to partial stalling of the main airfoil as a result of the poor coverage of the slipstream. Not enough experimental data are available to establish either the upper or lower limits of the ratio of rotor diameter to span which is permissible if stalling is to be avoided.

► **Rotor Data—NACA** tests on the one-third scale model of the XF5U-1 included measurements of the pitching moment vs. lift coefficient at various aileavator settings through the transition range. These measurements were made with the rotor blades locked so as to represent rigid rotors and also with them free to flap about hinge axes so inclined that for each degree of flap there were 2 deg. of blade twist.

Fig. 6 shows the variation of pitching moment coefficient with lift coefficient for the rigid rotors. As will be seen, the aircraft is statically unstable and at the higher lift coefficients exhibits an uncontrollable tendency to proceed to the hovering attitude. These results indicate that rigid rotors are unsuitable for use in the transition range for this convertible configuration.

Fig. 7 shows a similar set of curves for the articulated rotors. The difference is obvious. With the blades flapping about an inclined hinge axis so that they are twisted by the flapping motion, the side force relieving effect is too large and the tests indicate that although the slope of the curve of C_m vs. C_L are stable, aileavator power is not sufficient to trim at the high angles of attack corresponding to high values of C_L.

There are at least two possible remedies for this lack of ability to trim with the flapping blades. One is to use the large trailing edge flap shown in Fig. 1, as an auxiliary longitudinal control at

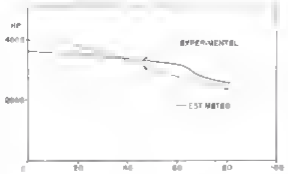


Fig. 4. Horsepower needed for level flight.

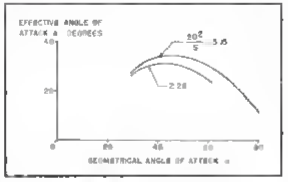


Fig. 5. Effective versus geometrical angle of attack, transition flight range.

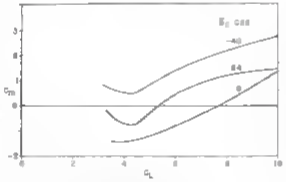


Fig. 6. Pitching moment coefficient vs. lift coefficient for rigid rotors.

high angles of attack, as is necessary in any event when near the ground. The other is to reduce the load relieving effect of the propeller by changing the hinge angle inclination to reduce or eliminate the blade twisting motion accompanying the flapping.

This seems to be obviously indicated when comparing Figs. 6 and 7 and is confirmed by the fact that a lightly loaded, low powered prototype of this aircraft having blades which flapped but did not twist has been flown at an attitude angle of 41 deg. in level flight on numerous occasions.

Although it appears probable that longitudinal control can be achieved successfully in the transition range it is also probable that it will be necessary to accept a certain amount of static longitudinal instability. This is evident in a general way from the consideration that nearly full up elevator will be required at some speed in the transition range whereas the elevator setting for trim when hovering is near neutral. The seriousness of this deficiency can only be assessed from full scale flight experience.

The NACA wind tunnel tests did not include measurements of aileron and rudder effectiveness in the transition range but since both rudders and ailavators remained within the slipstream during the transition, it can be presumed that the surfaces retained their effectiveness as controls. No measurements were made of the static or rotary stability derivatives governing directional and lateral stability.

From the known behavior of the full scale prototype flying at 41 deg. in the upper portion of the transition range and the behavior of models in hovering flight, coupled with the assumption of smooth, unstalled flow on the main airfoils and the tail surfaces throughout the transition range, it seems reasonable to infer that no violent directional or lateral instability will occur, but that there will be an increasing tendency toward lateral oscillations as hovering flight is approached.

► **Flight as Plane**—Primary objective in developing a convertible aircraft is to achieve cruising performance and economy approaching that of a conventional plane while retaining the ability to land and take off as a copter. Any convertible which fails to do this will almost certainly fail to compete with existing types of conventional planes and helicopters.

Cruising speed and economy of a convertible aircraft of the type under discussion are governed primarily by three factors:

- Aerodynamic cleanness.
- Overall size and weight.
- Rotor performance as a propeller.

First two of these factors are important for all convertibles, or all aircraft for that matter. They are especially important in the case of the low aspect ratio convertible under discussion. The low-aspect ratio airfoil tends to be at a disadvantage at cruising speeds because of its relatively high induced drag.

This disadvantage can be minimized only by taking advantage of the possibility of reducing parasite drag to a minimum by housing the powerplant, landing gear, and useful load entirely within the airfoil. If this is done, the L/D ratio at cruising speeds can be made equal to or better than for a competitive conventional airplane. If it is not done, the low aspect ratio aircraft will not be competitive.

In any aircraft low gross weight and small size for a given useful load and horsepower are essential to a high cruising performance and economical operation. It is especially important in a low aspect ratio craft that the weight be kept to an absolute minimum.

The principles underlying the need for aerodynamic cleanness together with low weight and small size for high cruising performance with good economy are well known by all aircraft designers. On the other hand, attainment of satisfactory propulsive efficiencies at high cruising speeds with rotors which must be of sufficient diameter to sustain the aircraft in hovering flight presents a design problem worthy of discussion.

It is convenient to present propeller characteristics in plots of V/nD vs. C_s and η vs. C_s, where V is forward velocity in fps., n, revolutions per sec., D, propeller diameter, and C_s (a non-dimensional power coefficient) = 0.638 × mph / (hp)^2 (rpm)^2, mph being forward speed, hp. the brake horsepower applied to propeller, and rpm the propeller rotational speed.

► **Propeller Plots**—A typical plot of propeller characteristics is shown in Fig. 8. If one assumes a set of conditions of horsepower, forward speed, propeller diameter, and propeller rpm., the values of C_s and V/nD are fixed.

If a design chart is available for a propeller similar in solidity, number of blades, blade airfoil sections, blade planform and blade twist distribution to the rotor under consideration, it then is possible to pick from the plot of V/nD vs. C_s the blade angle required to absorb the horsepower under the stated conditions. Propulsive efficiency can then be read from the plot of η versus C_s for the various blade angles. This process of propeller selection is well known but is repeated here to establish a basis for the following discussion.

For a given propeller, it is possible to draw a curve on the chart of V/nD vs. C_s which is the loci of the V/nD and C_s points which correspond to the maximum efficiency for the propeller. (All of this discussion neglects Mach number effects, generally permissible if the tip Mach number is less than 0.8.)

If the propeller is to give optimum performance at cruising speed, the diameter should be chosen to give a value of C_s and V/nD which will fall on the curve for maximum efficiency. The diameter so determined will be much smaller than that required for sustentation of the aircraft in hovering flight.

Increasing the propeller diameter without changing rpm. results in a decrease in V/nD and the propeller blade angle required is less than that for maximum efficiency. If the propeller rpm. is decreased to increase V/nD, C_s is also increased and the design point tends to move parallel to the line for maximum efficiency rather than back to it.

In general, some improvement in efficiency can be gained by reducing the rpm., but only in a very unusual case will it be possible to bring the design point back onto the maximum efficiency value.

Design experience indicates that for cruising speeds of less than 250 mph., it is probably not worth while to provide two speed gearing to increase the efficiency at cruising without sacrifice of effectiveness as a producer of static thrust. For cruising speeds above 250 mph., it will probably be desirable to provide two speed gearing, and for cruising speeds of 400 mph., it is undoubtedly necessary to provide two speed gearing.

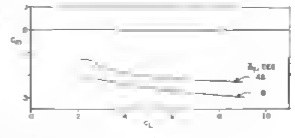


Fig. 7. C_m vs. C_L for articulated rotors.

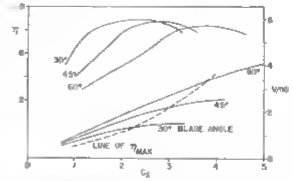


Fig. 8. Typical propeller design chart.

► **Efficiency**—As is indicated from the foregoing discussion, the provision of a rotor diameter large enough to permit the attainment of sufficient static thrust for hovering results in a decrease in propulsive efficiency. This decrease tends to become serious very rapidly, especially if there is no provision for two speed gearing, so that the selection of a rotor diameter for a convertible of the type under discussion is a matter for intensive investigation in the design stage.

Tendency for the efficiency to fall off with increase in diameter arises from the fact that the propeller blade section drag is becoming excessive. This tendency can be partially counteracted by using a minimum number of blades, minimum blade width, and blade sections having the lowest possible section drag.

Unfortunately, there are structural limitations which must be observed. Also, the consideration pointed out earlier in regard to the loss of intensity of the slipstreams and the resultant increase in effective angle of attack of the airfoil in the transition flight range must be kept in mind.

► **Performance Considerations**—One interesting phenomenon affecting the performance of a low-aspect ratio aircraft having wing-tip propellers is the reduction of induced drag which results from the propeller torque effect upon the wingtip vortices. Theoretical considerations indicate that the induced drag will be

$$D_i = \frac{W}{\pi q b^2}\left(1 - \frac{8.4Q}{DW}\right)$$

where D_i is induced drag; W, weight, Q, propeller torque, b, span, and q flight dynamic pressure.

Such experimental evidence as is available is not sufficient to prove or disprove the validity of the analysis which led to the above relationship.

The experimental values agree in general with the theoretical values for blade angles of interest in cruising flight. The factor $8.4Q/DW$ is not large in cruising flight but can make a significant difference in the range attainable. Its neglect in performance calculations will lead to unduly pessimistic values of rate of climb, cruising speed, range, and ceiling.

This factor furnishes an additional reason for using the lowest possible propeller rotational speeds for a given diameter.

In connection with the cruising performance of the subject convertible, there is a second very important consideration in addition to that of attainment of high cruising speeds for a given power. This is that the aircraft must be able to maintain level flight at a reasonable altitude on a single engine.

A craft of this type must have two engines for reasonable safety, since the propeller disk loading is far too high for autorotative descent. This consideration also enters into the selection of the ratio of rotor diameter to span, since if that ratio is high, it will be possible to hover with a load that cannot be maintained in level flight with a single engine.

Stability and control of this type of aircraft in cruising flight present only one unusual problem. The use of articulated rotors earlier shown to be necessary tends to minimize the flapping effect of the rotors but, at the same time, introduces a new factor which tends to decrease the dynamic stability of the craft.

This antidamping effect is caused by a force in the plane of the rotor disk which results from the aerodynamic moment necessary to overcome the gyroscopic moment of the rotor in turning flight. This effect is probably not serious for convertibles of low wing loading and low blade weight but is a serious problem for a craft with high wing loading and heavy rotor blades.

► **Primarily A Propeller**—Opinions regarding the feasibility of using the rotor of a convertible for both sustentation at low speeds and propulsion at high speeds have ranged from the belief on one hand that it cannot be done at all, to the belief, on the other hand, that a conventional helicopter rotor will be satisfactory.

Actual design experience indicates that both of these opinions are wrong.

The same rotor can be used for both conditions, but it must be primarily a propeller, must have a much higher disk loading than is customarily provided in helicopter rotors, and must be properly engineered to fit the aircraft

References

1 Lange, Roy H, Cooke, Bennie W Jr and Proterra, Anthony J Preliminary Full Scale Investigation of a ¼-Scale Model of a Convertible-Type Aircraft NACA RM L9C29, June 7 1949

2 Lange, Roy H and McLemore Huel C Static Longitudinal Stability and Control of a Convertible-Type Airplane as Affected by Articulated and Rigid-Propeller Operation NACA RM L9C24

Hangar Door Designed On "Slat" Principle

A new type of hangar door, which opens by retracting into the ground and can be operated similarly to a venetian blind, has been designed by a West Coast inventor for use in all types of climate

Consisting essentially of horizontal slats supported by a series of vertical columns spaced 15-30 ft apart, the door is claimed to be not only efficient, but less costly than conventional overhead types now commonly used. It was developed by Charles Mackintosh, Los Angeles consulting engineer.

As the door opens, the vertical columns lower into shafts in the ground and, at the same time, carry with them the horizontal panels which stack like a deck of cards in a shallow trench. The top panel forms the load carrying cover over the trench

As the door closes, the columns move up and through a locking device, pick up and secure the panels in the correct position, one at a time. The panels may be completely closed or, like the slats of a venetian blind, partially tilted for ventilation

Several advantages claimed for the installation:

Cost of building door frame is low, since no heavy over span structure is necessary

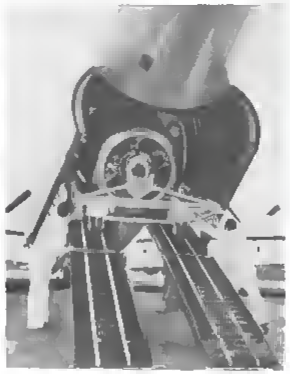
It does not require elaborate bracing structure sometimes required by wide, sliding-type doors

Operating mechanism is conveniently and economically located on the ground with cables in the panel trench

The door, or a particular section of it, is operated by means of cables wound on a hoist drum or controlled by hydraulic cylinders. It reportedly can be dropped in a matter of seconds

According to Mackintosh, windows having metal frames and wired glass can be installed in the horizontal panels. Access provisions also can be made for men and trucks. The new door is stated to meet all structural standards and to be readily adaptable for many different applications. One, is its use all or part way around a building to form removable walls

PORTABLE DOLLY . . .
Boeing device for handling P&W 3500 hp Wasp Major power unit on B-50 and C-97 is rolled onto its wheels.



TRUCKS POWER PACKAGE
With rockers dismounted, dolly carries power unit up ramp and into plane, with power supplied by hoist cable

ENGINEERING FORUM

Metal Bond Explained

The Industry Observer column of your Nov 14th issue commented that some American structural engineers are dubious of the reliability of the metal bonding used in the de Havilland Dove and Comet and in the Convair B-36, because of an implied deterioration after prolonged exposure to low temperatures. I wonder if the supposed deterioration is not being confused with the reduction in strength that has been observed in laboratory tests

It is true that most bonded joints exhibit lower strengths at very low temperatures, but there is no evidence of any deterioration of the adhesive. The joint strength returns to normal immediately upon return to normal temperature

The more widely used metal to metal bonding adhesives actually become stronger at low temperatures. This is effectively demonstrated by tests of bonded metal scarf joints, similar to those common in wood construction, which show a progressive increase in strength with decrease in temperature.

The reason that conventional bonded metal joints become weaker is that the distribution of stress across the joint is non uniform, the degree of non uniformity depending in part upon the stiffness of the bond material. In a simple lap joint the peak stresses occur at the ends of the over lap. When the joint is subjected to decreasing temperatures, the bond material becomes progressively stiffer, increasing the non uniformity of stress

At some temperature, which depends upon the adhesive, the peak stresses in the joint begin increasing at a faster rate than the rate of increase in adhesive strength. As a result, the strength of the conventional type of joint ultimately becomes lower than at normal room temperature

On the other hand, as stated above, the strength of a scarf joint progressively increases with decreasing temperature, because the distribution of stress is uniform. I wish to emphasize that the strength of either type of bonded joint merely exposed to low temperatures regardless of the length of exposure time, is unimpaired upon subsequent return to normal temperature

The decrease in strength exhibited by conventional bonded joints is orderly and predictable. Therefore, it is only necessary to know the temperature vs. strength relationship in order to insure the integrity of a structure

Naturally, efforts are being made to develop metal to metal bonding adhesives that are less susceptible to the low temperature effect, in order that structural efficiency need not be sacrificed unduly while insuring adequate strength

It is important that no one is misinformed concerning the reliability of metal to metal bonding, because it gives promise of finding extensive use in aircraft construction. The relatively long experience of this compound in its use, in conjunction with our Metalite sandwich, has given convincing proof of its reliability, structural efficiency and adaptability to mass production when employed discriminately.

W. A. Pitman
Supervisor of Structures Development
Chance Vought Aircraft,
Division of United Aircraft Corp.,
Dallas, Tex.

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and MOTOR PROBLEMS

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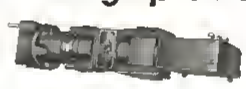
Typical EEMCO solutions of difficult Actuator and Motor design problems

STARILIZER ACTUATOR, Linear Type
Magnetic clutch, radio noise suppressors. Normal load 2500 lbs. Maximum load 8,000 static, 20,000 lbs. Stroke 7-3/2 to 8 in. Rate of travel: 62 inches per second. Weight, 17 lbs. Non jamming end stops.



CANOPY ACTUATOR, Rotary Type
Inline rotary actuator equipped with clutch and brake. Radio noise filter. Designed to meet no existing space requirement.

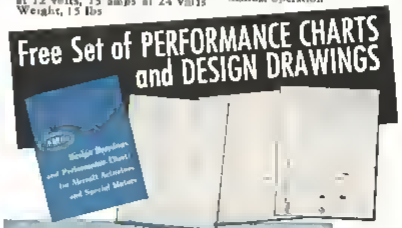
EXPLOSION-PROOF HYDRAULIC PUMP DRIVE
Equipped with inline gear reduction. Gearbox designed to keep acoustic noise level at an absolute minimum. For continuous duty operation with duty cycle varying from 1-1/2 to 3 H.P. load. Designed to operate for 2000 hours without maintenance. Operates in a vertical position. Weight, 20-1/2 lbs.

STARTER-GENERATOR FOR JET TURBINE
12 or 24 volts. 70 inch lbs. torque at 2000 R.P.M. as a starter. Continuous output as a generator—35 amps at 12 volts, 15 amps at 24 volts. Weight, 15 lbs.

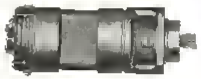
VARI-CAM ROTARY ACTUATOR
Magnetic clutch and brake. Over load torque limiter. Provisions for manual operation.

STANDBY MOTOR FOR WING FLAP ACTUATOR
Equipped with radio noise filter, magnetic clutch and brake. Brake torque, 30 inch pounds.

EXPLOSION-PROOF AILERON BOOSTER MOTOR
Explosion proof, continuous duty 1-1/2 H.P. continuous duty rating. Peak intermittent duty rating, 2.7 H.P.



Performance Charts and Design Drawings for the above units, and many others, will be sent to executives and engineering and design personnel making request on company letterhead. These prints illustrate solutions of difficult design problems. They may suggest answers to similar problems of your own. Additional prints, for permanent reference file, supplied as released.



PILOT SEAT ACTUATOR MOTOR AND CLUTCH
30 second duty cycle 1/2 minute out of 10 minutes at 95 watts output. Weight, 18 oz. Specifications can be varied to suit special conditions

GUIDED MISSILE CONTROL MOTOR
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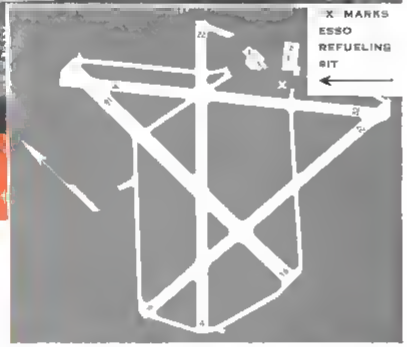

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Poles Develop Their First Copter

With earlier developments thwarted by lack of know-how, craft indicates new source of technical information.

The first successful Polish helicopter has been developed at the Gowny Instytut Lotnictwa (Chief Aviation Institute). Preliminary details indicate that the two place craft has a universally mounted rotor head, two wooden blades, and a tail anti-torque rotor. Fuselage construction is wood and metal. Landing gear is tricycle type, and there is a tail skid for protecting the tail rotor in event of a faulty landing.

▶**Progress Slow**—Credited with the copter's design is Zbigniew Brzoska, departmental chief of the design and experimental section of the Gowny Instytut.

Polish lack of previous helicopter design experience, skilled technicians and workers, and relevant literature delayed start on development of the craft until the spring of 1948. Work progressed slowly, until in May 1949, when it was decided to have the prototype ready by July 22, occasion of the People's (Polish) Committee of National Liberation Manifesto.

▶**Component Construction** — The craft's various components are built up as follows:

• **Fuselage** is composed of two main assemblies welded steel tube and wood, fabric-covered main section containing cabin, aircooled engine, rotor shaft and head, and landing gear, and the tail boom which is a plywood covered wood monocoque structure.

• **Main rotor** has blades of NACA 43012A section, plywood covered. Additional stiffness has been obtained by inserting a steel strip the length of the blades, and by bracing ribs with loosely tensioned duraluminum wire. Angle of incidence decreases nine degrees from root to tip improving power performance at a slight loss in auto rotative qualities.

Pilot blades, regulating cyclic pitch and providing dynamic stability, are attached with main blades to two annular coupling arms forming the universal joint, located on the driving shaft.

Transmission is by means of a 60 mm. tubular shaft, through double planetary gears directly above the vertically mounted engine. Reduction gear ratio is stated to be 1.9. Rotor tip speed is given as 410 fps. Manual declutching of motor and rotor is possible in flight.

• **Anti-torque rotor** has two blades absorbing seven percent of total power at maximum torque. Plane of rotation may be inclined. Tail rotor controls are located in the upper section of the circular tail boom.

▶**Flight Control**—The craft has automatic hydraulic control of collective pitch, permitting control of lift by means of throttle alone. The controls of the new craft can be divided into two groups:

• **Control column** controlling inclination of thrust vector of rotor. Pushing control column forward causes forward flight, throttle controls speed of ascent and descent, and rudder bar controls rotation of craft around the vertical axis.

• **Wheel** regulates plane of rotation of tail rotor, regulator allows adjustment of collective pitch, permitting choice of engine revs and rotor speed, clutch allows clutching and declutching main and tail rotor simultaneously, and there is a means for centralizing rudder bar independently of rotational movement.

▶**Specifications**—Rotor dia. is 28 ft. 11 in., tail rotor dia. 5 ft. 10¾ in., distance between main/tail rotor axes 17 ft. 4 in., height of main rotor head from ground 7 ft. 6 in., disk area 656 sq. ft., tread 7 ft. 8¼ in.

Weights are given as follows: Empty 836 lb., useful load 440 lb., gross 1276 lb. Disk loading is 1.925 lb./sq. ft.

The following performance is claimed: Maximum level speed 87 mph., maximum cruising speed 73.5 mph., maximum vertical climb 8.2 fps., maximum forward ascent 11.5 fps., range 175 mi.

USAF, Navy Bid Information

Air Materiel Command Procurement Division makes available to AVIATION WEEK the latest bid awards, shown on this page. Requests for further information should be addressed to Contracting Officer, AMC, Wright-Patterson AFB, Dayton, Ohio, attention MCPPSX72.

ABSTRACTS

For projection equipment (80-104):
Viewlex Inc., Long Island City, New York, on a bid of $14,665.

For aircraft generators (80-220):
Jack & Heintz Precision Industries, Inc., Cleveland, on a bid of $395,665.63.

For radio frequency amplifier AM-18 (80-230):
Radio Receptor Co., Inc., Brooklyn, on a bid of $45,229.24.

For 3500 transformers (80-299):
American Gas Accumulator Co., Elizabeth, N. J., on a bid of $68,705.

For bracket assemblies (80-300):
Camloc Fastener Corp., New York, on a bid of $348.80; Lion Fastener Inc., Henrose Falls, New York, on a bid of $640; Meneelock Mills, Sae Leonard, Calif., on a bid of $42; Dzus Fastener Co., Inc., Babylon, N. Y., on a bid of $1358.50; Dumont Aviation & Supply Co., Long Beach, Calif., on a bid of $1000; and Clary Multiplier Corp., Aircraft Hardware Div., Los Angeles, on a bid of $31.24.

For 3000 cup assemblies (80-298):
Lile Manufacturing Co., Inc., New York, on a bid of $13,640.

For 61,168 square inches phenolic sheets (80-280):
St. Regis Sales Corp., New York, on a bid of $6773.61.

For panelboard and maintenance data (80-323):
Lincoln Electric Products Co., Inc., Orange, N. J., on a bid of $7655.

For cabinet relay assemblies (80-267):
Joseph Weldenhoff, Inc., Chicago, on a bid of $8285.60.

For drawing, tracing, & office tables (80-306):
Engineering Manufacturing Co., Sheboygan, Wis., on a bid of $62,164.48; United States Blue Print Co., Chicago, on a bid of $7644.08; The Frederick Post Company, Chicago, on a bid of $12,181.40; Lawman & Erb Manufacturing Co., Washington, D. C., on a bid of $11,526.05; and Sherman-Munson Corp., St. Marys, Ohio, on a bid of $6382.40.

For cable (80-207):
Wire & Cable Division, Electric Auto-lite Co., Port Huron, Mich., on a bid of $26,207.44; Packard Electric Division, General Motors Corporation, Warren, Ohio, on a bid of $124,465.55; U. S. Rubber Co., Electrical Wire & Cable Division, Bristol, R. I., on a bid of $54,71.05; and General Electric Supply Corporation, Dayton, on a bid of $24,510.81.

For spark plugs (80-194):
The R. G. Corporation, New York, on a bid of $422,220.00.

For valve, drain, hydro-carbon (80-160):
Auto Valve, Inc., Dayton, on a bid of $11,350.80; and Koehler Aircraft Products Co., Inc., Dayton, on a bid of $4700.00.

For indicator, amplifier, transmitter & tech data (80-225):
Eclipse Pioneer Division, Bendix Aviation Corp., Teterboro, on a bid of $326,627.88; and United States Gauge, American Machine and Metals, Inc., Sellersville, Pa., on a bid of $285,508.12.

For adapter, bolt, elbow plug, reducer & tee (80-287):
V. L. Graf Co., New Baltimore, Mich., on a bid of $5047.90; Aircraft Fitting Co., Cleveland, on a bid of $1227.50; Pan American Tool & Machine Corp., Dayton, on a bid of $2670.00; The Drutsch Co., Los Angeles, on a bid of $946.00; and Pacific Piston Ring Co., Los Angeles, on a bid of $7486.00.

For antenna, mounting, data (80-202):
Phaostron Co., South Pasadena, Calif., on a bid of $48,864.56; and Specialty Assembling & Packing Co., Inc., Brooklyn, on a bid of $6765.52.

For bell top-safety (80-289):
Aerocraft, Austin, Tex., on a bid of $4656.12.

For lamp assy., spotlight assy. (80-314):
Manhattan Lighting Equipment Co., Inc., New York, on a bid of $3462.56; and Appleton Electric Company, Chicago, on a bid of $15,056.00.

For paper, photographic, etc (80-237):
The Haloid Company, Rochester, on a bid of $34,460.67.

For transformer distribution (80-200):
General Electric Company Dayton on a bid of $33,25a 16 and American Transformer Co., Newark, N. J., on a bid of $3119 00

For microscope (80-241):
Kinsmen Optical Company, Washington, D. C., on a bid of $2142 83

For material & services for processing 16mm & 35mm film (80-302):
Crescent Film Laboratories, Inc., Chicago on a bid of $20,000.00

For electric steel (80-317):
P. R. Hoffman Co. Carlisle, Pa., on a bid of $8235.00

For roble polychloroprene sheet bed (80-329):
General Cable Corp., Cincinnati, on a bid of $58,625 00

For 2 pumps (80-340):
Kinney Manufacturing Co., Boston, on a bid of $3178 50

For ball bearings (80-354):
Norma-Hoffman Bearings Corp., Stamford, Conn., on a bid of $1280 and The Fafnir Bearing Co., New Britain, on a bid of $2898

For 3005 hydraulic hose assemblies (80-380):
Aeroquip Corp., Jackson Mich., on a bid of $28,837 26

For 10 mixer assemblies (80-387):
Greer Hydraulics Inc., Brooklyn, on a bid of $13,300

For 6030 cultivators, rice (80-345):
Globe Wernicke Co., Washington, D. C., on a bid of $6 20 24, Security Steel Equipment Corp., Avenel, N. J., on a bid of $24,482 80 and Multiplex Display Fixture Co., St. Louis, on a bid of $17,784

For 40 oil remote control switches (80-397):
General Electric Co., Aircraft, Feed & Marine Divns., Dayton, O., on a bid of $8000

For rotenone (80-341):
Hartman Electrical Manufacturing Co., Mansfield, O., on a bid of $28 787 70

For rollers (80-331):
Ideal Electric & Mfg. Co., Mansfield, O., on a bid of $23,650

For 20 000 gaunlet mantles (80-311):
Getman Process, Inc., Brooklyn, on a bid of $42,200

For felt wool (80 370):
Western Felt Works, Chicago on a bid of $6525 28, American Felt Company, New York on a bid of $2773 40 and Standard Felt Co., Div. of Huntington Land & Improvement Co., Alhambra, Calif., on a bid of $42,782 10

For 2750 cone end roller assemblies (80-377):
Timken Roller Bearing Co., Canton, O., on a bid of $21,044 25

For books, periodicals, subscriptions ($8-398):
W. P. Falk—Books, Cincinnati, O., on a bid of $100,000.

For display boards (80-400):
Globe-Wernicke Co. Washington, D. C., on a bid of $81,035 90 and Jamestown Metal Corp., Jamestown, N. Y., on a bid of $70,538.

For 50 000 crystal units (80-357):
Midland Manufacturing Co., Inc., Kansas City, Mo., on a bid of $64,500.

For 15 resistor assemblies (80-328):
Thwing-Albert Instrument Co., Philadelphia on a bid of $1875; Akeley Camera & Instrument Corp., New York on a bid of $1,250 and Palmer Manufacturing Co., Cleveland on a bid of $751 85.

For aluminum rods (80-383):
Reynolds Metals Co., Louisville, on a bid of $9912 and Aluminum Co. of America, Washington D. C., on a bid of $4861 56

For nuts (80-2181):
Companies sharing—Air Associates Inc., Teterboro on a bid of $91 Elastic Stop Nut Corp. of America, Union N. J., on a bid of $21 780 50, Standard Pressed Steel Co., Jenkintown Pa., on a bid of $12 238 40 and Dixon Company, Inc., Los Angeles on a bid of $31 248

For 5 inserts (80-338):
Greenlee Electric Co., Inc., Dayton, on a bid of $1001 55

For packing gaskets (80-1681):
Companies sharing—Goshen Rubber & Mfg. Co., Inc., Goshen, Ind., on a bid of $34 50; Parker Appliance Co., Cleveland, on a bid of $15 051 13; Plastic & Rubber Products Co., Los Angeles, on a bid of $6584 31; Aero Supplies of Los Angeles, Inc., Los Angeles on a bid of $7 371 41 and Linear Inc., Philadelphia on a bid of $8868.14

For 65 000 square yards Fril-sky acrolite fabric (80 270):
H. I. Thompson Co., Los Angeles, on a bid of $122 140

For 120 control accumulators (80-282):
Simmonds Aerocessories Inc., Tarrytown, N. Y., on a bid of $4009 20

For 30 000 filling assemblies (80-298):
Companies sharing — Aeroquip Corp., Jackson Mich., on a bid of $18,798., and Arnecraft-Hoile Flying Service, Austin, Texas, on a bid of $2288

For 7 vapor type thermostats (80-380):
Phillips Manufacturing Co., Chicago on a bid of $1695

For regulators (80-350):
General Electric Co., Aircraft, Feed & Marine Divns., Dayton, on a bid of $7363.

For 140 000 containers (80-334):
Specialty Assembling & Packing Co., Inc., Brooklyn on a bid of $3386

For barometers (80-331):
Wallace & Tiernan Products, Inc., Belleville, N. J., on a bid of $31 2e8

For filter assemblies and parts assemblies (80-109):
Companies sharing—Hamer D. Bronson Co., Beacon Falls, Conn. on a bid of $2886, Moynehan Bronze Co., Inc., Detroit on a bid of $15 510, Manhatton Lighting Equip. Co. Inc., New York on a bid of $240 30—Hydromatic, Los Angeles on a bid of $252—and Industrial Precision Products Co., Chicago on a bid of $111 8

For inverters (80-421):
Elcor Inc., Chicago, on a bid of $867,-81 37

For filling assemblies (80 100):
Aeroquip Corp., Jackson Mich., on a bid of $1 1840

For 8 lathes (80-288):
Companies sharing—Sidney Machine Tool Co., Sidney, O., on a bid of $96 815 18 and E. A. Kinsey Co., Cincinnati, on a bid of $15 121 02

For 30 indicator assemblies (80-310):
Dayton Wheel Co., Dayton, on a bid of $6386 56

For plastic shroud (80 356):
Rohn & Haas Co. Philadelphia, on a bid of $133,015 83

For packing, rubber (80-241):
Companies sharing — Plastic & Rubber Products, Dayton on a bid of $172 70; Linear Inc. Philadelphia, on a bid of $12 30; B. F. Goodrich Co. Akron on a bid of $131; Sponge Rubber Products Co., Shelton Conn., on a bid of $1966 11; Davidsen Rubber Co. Charleston, Mass. on a bid of $11184 97 and Rubatex Division, Great American Industries, Inc., Bedford, Va., on a bid of $380

For lamp assemblies (80-242):
Companies sharing—Revere Electric Mfg. Co., Chicago on a bid of $17,140.20, and American Gas Accumulator Co., Elizabeth, N. J., on a bid of $130 215

For aircraft nuts (80-364):
Companies sharing—Lamson & Sessions Co., Cleveland, on a bid of $1472.30, Clary Multiplier Corp. Los Angeles, on a bid of $197 64, and Air Associates Inc. Teterboro, on a bid of $2960

AF Invitations to Bid

Bids openings are 20-30 days after approximate issue dates shown in the following bid proposals. Bid sets containing specifications for items to be procured will be sent to qualified applicants who state bid invitation number.

One bid set will be available for examination without obligation by prospective builders, after bid publication date, at each of the seven AMC procurement field offices. This will enable firms to see specifications before writing or telegraphing for their own bid sets.

Procurement field office locations: Boston Army Base, Boston 10, Mass.; Government Aircraft Plant No. 4, Ft. Worth 1, Tex.; 39 S. LaSalle St., Chicago 3. Wright-Patterson AFB., Dayton, Ohio. West Warren and Longo Aves., Detroit 32, 155 W. Washington Blvd., Los Angeles, 67 Broad St., N. Y. 4.

INVITATIONS

Small hardware, 41 items, exhaust collector ring clamps, general purpose clamps manifold couplings self-port straps, Merman Products Co., Invitation No. 8887; bids due Jan. 8

Snapslide fasteners, 2298 ea., complete set AN2188-4 nine 1800 snapslide studs, AN2188-1; Invitation No. 8896; bids due Jan. 18

Navy Awards

The Navy has announced the following contracts for aviation items:

Pinarl Oil & Refining Co., Oklahoma City, Okla., refining aircraft engine oil, $36,850 gal., $77,050

Bendix Aviation Corp. (Eclipse-Pioneer division), Teterboro, N. J., inverters $284-216

Telford Mfg. Co. division, United Advertising Corp., New Haven Conn., aircraft electrical accessory test assembly, $288,885.

Allcraft Mfg. Co. division of Garrett Corp., Los Angeles, rough drafts and reproducible manuscripts, $85,893.

J. M. Bonorli & Co., Brooklyn, N. Y. radio receiving sets, $281,284

Navy Bid Proposals

The following bid invitations have been announced by the Navy Dept. Aviation & Supply Office at Philadelphia. Bid forms may be obtained from the Aviation & Supply Office, Oxford Ave. and Martin's Mill Road, Philadelphia. Specifications are not furnished unless requested by number.

Indicators & transmitters, 370 fuel flowmeter indicators, RSS-1-1284; 310 ea. fuel flowmeter transmitters, RSS-T-1041; 400 fuel flowmeter amplifiers, RSS-A-488-250 indicators, RSS-1-1210; 340 transmitters, RSS-T-1082; 328 amplifiers, RSS-A-488-25, specs. MIL-I-8878, -T-8877, -A-8878; invitation No. 8885; bids due Jan. 12

Safety belts, 240 sets, shoulder harness, short straps, illois NAF 1258-1, invitation No. 8848; bids due Jan. 11

Resistors, 152 items fixed comp. ¼ watt, spec. JAN-R-11, invitation No. 8884, bids due Jan. 8

Capacitors, 71 items fixed & variable, various types mfgrs. nos. Invitation No. 8884; bids due Jan. 10.

Aircraft tools 1860 steel counterstocks, 415 ea. drill reams, 230 chucking reamers, 510 dille specs. MIL-C-932, -931, MIL-R-1918 invitation No. 9839; bids due Jan. 18

Valves 8 ea. hydr. shuttle, 5 ea. hydr. diverting for PO-1W arft.; Lockheed nos.; invitation No. 9917; bids due Jan. 13

Fastener parts, 12 500 ea. stud assembly steel Camloc Fastener, invitation No. 9843; bids due Jan. 18

Flexible controls 85 ea. for TBM-3 acft., Grummau Acft. Engineering Corp., invitation No. 8844; bids due Jan. 15

Synthetic rubber, 2750 sq. yds., fabric base sheet gr. A type I, 017 in. x 36 in., BuAer spec. 52-R-18, invitation No. 8951; bids due Jan. 13.

Hydraulic directional control valves, 95 ea. for P8V-6A, JRP-5 acft. Spec. ANV4 invitation No. 8954; bids due Jan. 8

Green runway light filters 618 ea., Raytre Electric 7080-12 invitation No. 8888, bids due Jan. 8

Fasteners & Forts, 8 items, incl. grommets, studs Dzus Fastener nos., invitation No. 8872; bids due Jan. 28

NEW AVIATION PRODUCTS

Operators Study New Safety Light

It is approved for use in all hazardous locations, such as refueling areas, and is said to be explosion-proof.

A new type of explosion proof light, reportedly the only unit of its kind approved by the Underwriters' Laboratories for use in all extremely hazardous locations, is attracting the interest of Wright Field, airport operators and oil companies supplying aviation gasoline.

In place of the heavy, light-dimming glass shield on conventional units, the new light uses air pressure to keep out dangerous vapors. According to the maker, Safe Lighting, Inc., 90 16 Astoria Boulevard, New York, N. Y., it is the only lighting fixture in the world with this feature. The underwriters' have fully approved it for Class I, Groups A, B, C and D, hazardous locations—the worst known.

▶**Portable Unit**—The company thinks it will see wide service as a portable light on airport aprons. According to William F. Wholey, Safe Lighting president, design blueprints of a portable submitted by the company already have been approved by Wright Field. Such a unit could be used for instance, as a close-in light source for aircraft refueling operations at night.

Wholey says Gulf Oil Co. plans to remove present overhead lights and install airpressure units on its tank truck loading platforms at Newark Airport.

▶**Varied Uses**—He particularly recommends its use in paint spray booths, hangars, and other locations where highly explosive atmospheres exist.

Cleaning and relamping operations are simple, requiring only quick outside polishing of single, flat lens surface, and removal of four lens-retaining bolts to take out faulty bulb. Unit also is said to have 88 percent reflectant co-efficient and "provide more illumination on the working plane with a 200W. bulb than is obtained with any 300W. conventional type unit."

Sealed air pressure introduced through Schrader valve insures that explosive gases will not enter unit and ignite on electrical spark generated in light circuit.

Accidental loss of pressure immediately opens air pressure switch to extinguish lamp and eliminate danger of live wires being exposed to atmosphere. Entire lamp section of unit (sealed pressure area) can be removed to safe location for lamp replacement simply by unscrewing ring-nut and pulling lower section down and out of electrical disconnect plug.

Miniature Chains

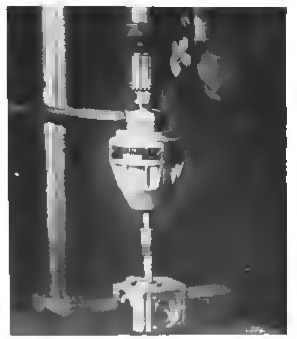
Miniature stud and load carrying chains, specifically designed for use around very small pulleys and sprockets, have been developed by Sierra Engineering Co., 123 E. Montecito Ave., Sierra Madre, Calif.

Chains have non corrosive and nonmagnetic qualities and are said to be particularly suitable for use with aircraft cockpit controls and miniature mechanisms requiring controls having greater accuracy, strength and lightness than steel cables now used.

Units are available in two different metals. Those made of stainless steel are suitable for most applications, beryllium copper chain was developed for electronic applications requiring completely non magnetic materials.

Stud and load carrying chains in either material weigh ¾ oz./lineal ft. and ¾ oz./lineal ft., respectively. Using stainless steel links and heat treated SAE 4130 pins, load carrying chain has yield strength of 310 lb. and ultimate strength of 428 lb., when made of beryllium copper, it has yield strength of 290 lb., an ultimate of 440 lb. With stainless steel links stud chain has yield of 100 lb. and ultimate of 170 lb., in beryllium, it has yield and ultimate strength of 80 and 140 lb. respectively.

Load carrying chain will operate around ⅜ in. pulley and is capable of passing through 180 deg. without binding or slipping. End fittings can be supplied to fit specific requirements. Stud chain will operate around 7-tooth sprocket having minimum dia. of .395 in.



For Honing, Lapping

"Angur Movement" transmission, for use with standard honing and lapping machines to accelerate production and finishing operation, is claimed to permit maintenance of quality standards on production basis effectively and expeditently at minimum cost.

Offered by **Metal Seal & Products, Inc.,** 21813 St. Clair Avenue, Euclid 17, Ohio, device also can be used with drill presses, screw machines and lathes. It is stated to eliminate circumferential marks and reduce number of parts rejected because of surface flaws. Faces, flats, cones, plugs and any diameter round hole can be finished quickly.

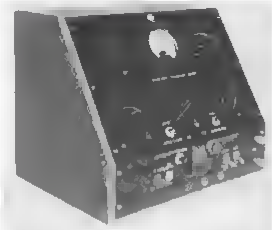
On jobs involving honing or lapping, device is utilized as a power transmitting unit between workpiece holder and power source. In operation, it reduces constant speed input to produce quick reversing action that interrupts rotation of output shaft every 45 deg. of travel. This interrupting action is short back up motion, occuring 8-11 times in one complete revolution of output shaft. Speed reduction is approximately 8 to 1.

Transmission (shown) is utilizing standard drill press as power source to lap three-way hydraulic selector valve. With device, lapping time in this particular operation takes only ¼ that formerly required. And since operation can be accomplished on drill press, larger equipment is freed for other jobs.

For Data Storage

Suitable for aircraft engineering executives requiring special blueprint file in private office, Ddaw-In-Dex cabinet made by **Empire Development Corp.,** 52 Broadway, New York 4, N. Y., stores 1000 prints, photostats, charts or photo blow-ups.

Prints can be located quickly through index file and any drawing can be quickly removed or replaced.



Tests Potentiometers

Resistance percentage bridge, engineered for testing and calibrating precision potentiometers, is announced by **Specialties, Inc**, Skunks Misery Rd., Syosset, L I, N Y Device measures percentage of total potentiometer resistance tapped in at any mechanical setting of wiper arm Accuracy is represented to be better than 01 percent at all settings from 0 to 100 percent of total resistance

Instrument incorporates modified Wheatstone bridge circuit, matching voltage drop across selected standard resistance against voltage drop across potentiometer under test Accuracy is not affected by rating of potentiometer being checked or by normal variations in supply voltage Equipment operates on 110v, a c power or low-voltage d c source Plug-in connections are provided for external galvanometer

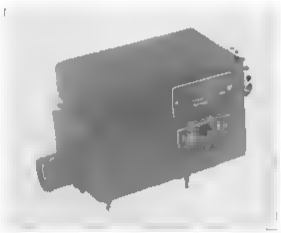


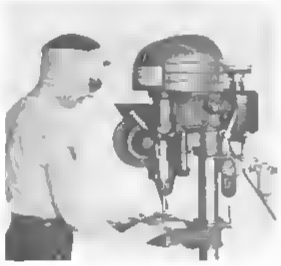
Photo Recording

Model III, 16mm synchronous cameras, for photographing events at two or more remote stations with exact shutter synchronization, are offered for wide industrial application in motion studies, performance of automatic control systems, synchronous cathode ray oscilloscope photography, flight test work, and guided missile flight recording and fire control system evaluation

Developed by **Flight Research Engineering Corp.**, Richmond, Va, units have shutter speeds of 5, 10 and 20 or 4, 8, 16 and 32 frames per second If timer is used for taking one frame per minute, 33 hr may be recorded on one roll of film Cameras use standard AN-A 6 or Syno Pack magazines, specially designed to eliminate film stop pages

Operation may be at temperatures from —50 to 110 F at altitudes up to 40,000 ft Metal parts are treated to resist corrosion

Provision is made for single exposure operation, timing and coding lights mark film to facilitate location of any given sequence or any marked frame without counting external synchronization pulse circuit is incorporated, any number of synchronized cameras may be used in parallel gang, clutch arrangement eliminates possibility of gaining or losing frame throughout magazine load of 50 ft of film, shutter synchronization is accurate to 1 millisecond, and camera is designed for use with radio synchronizing link



Speeds Production

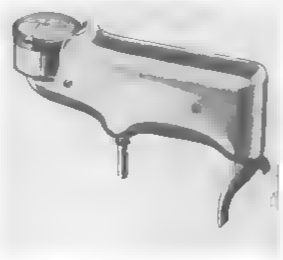
Power screw driver, introduced by **Shakeproof Inc.**, 2501 N Keeler Ave., Chicago 39, Ill, features hopper feeding, driving speed of more than one screw per second with smaller types, and uniform tightening torque

Practically all screw styles in sizes ranging from No 1 × ⅛ to ¼ × ¾ in are accommodated in specially designed hopper and driving spindle of machine Device operates on 110v, a c power source and compressed air supply line

Hopper positions each screw properly for traveling down track to bit where screw is firmly held in place until one or two threads are engaged As desired torque is reached, clutch automatically disengages driving spindle With release of foot pedal, spindle returns for another unit

Breaking or scarring of work is claimed to be eliminated, since clutch prevents over-tightening of screw An other mechanism enables operator to release jam caused by wrong sized unit

Experienced person reportedly can reset machine for different size or style in about 20 min Weighing 240 lb, machine requires 21 × 24 in floor space and can be adapted to conveyor lines



Dial Shows Hardness

For quickly checking hardness of non-ferrous metal or plastic parts, **Barber-Colman Co**, Rockford, Ill, offers Impressor hand hardness tester Device is suitable for spot checking of stock in any position or area where there's room for operator's hand.

Stated to be capable of accurate readings even when operated by inexperienced person, unit has conveniently located dial to indicate material hardness

For Bonding Jobs

New thermosetting resin composition, Adhesive A1, offered by **Armstrong Products Co**, Argonne Road, Warsaw, Ind, bonds large variety of materials to each other—metals, glass, ceramics, rigid plastics, wood, rubber, etc Resin mixture contains no volatile solvent and does not shrink or swell upon hardening

No primer coating or open assembly drying is required. Surfaces are coated with adhesive, brought together, and held with pressure sufficient to maintain uniform contact. Resulting bond is reported to be strong, moisture- and weather-resistant, and permanent.

Adhesive is supplied in two parts, resin composition and liquid activator Two liquid activators are available, one a fast reacting type giving rapid initial set (and a short pot life of 20-30 min.), the other a slower reacting type (with a pot life of 4 to 5 hr.)

Adhesive begins to cure as soon as activator is mixed with resin composition. At room temperature, glue line will develop about half its strength overnight with one activator, in 24-36 hr with other Full strength develops in about a week Temperature of 100 F will cure glue line twice as fast as room temperature

Examiner Backs PAA-AOA Union

But he recommends provision for employe protection, not imposed by CAB in previous merger decisions.

Endorsement of Pan American Airways' widely-criticized plan to buy American Overseas Airlines' properties and 9134 miles of trans Atlantic routes for $17,450,000 has come from Civil Aeronautics Board Examiner Thomas L. Wrenn

In a report aimed at separating unsupported charges from the facts of the case, Wrenn found that the revised PAA-AOA merger agreement is consistent with the public interest and will not create a monopoly restraining competition or jeopardizing another airline TWA contends that the deal is designed to further Pan American's 'chosen instrument' ambitions and would create a near monopoly which might force TWA out of trans-Atlantic operations (AVIATION WEEK, Dec 12)

► **Employes Protected**—A highly significant part of the examiner's report was the recommendation that approval of the PAA-AOA deal be conditioned on provisions for employe protection which were never imposed by CAB in previous mergers Wrenn favors application of the so-called Burlington formula (previously used in the railroad field and in the merger of Western Union and Postal Telegraph) to compensate personnel adversely affected by the AOA sale

PAA concedes that flight navigators, dispatchers and meteorologists employed by AOA might lose their jobs through the merger Other personnel might be downgraded

Pan American proposed a flat severance allowance of $2000 considerably less than a year's pay for most personnel But Wrenn called on CAB to protect employes against adverse consequences of the merger until July 5, 1952 (when AOA's temporary certificate expires), or for the period of the person's employment with AOA, whichever is less

Problems of seniority rights of AOA and PAA pilots in the merged company would be ironed out by private negotiations between the two pilot groups

► **Monopoly Issue**—Wrenn recognized that monopoly is a major issue in the case and conceded that the single carrier or chosen instrument is PAA President Juan Trippe's avowed ambition But the examiner said reduction of U S North Atlantic flag lines from three to two would not in itself create a monopoly and would not render TWA incapable of being an effective competitor

Further, Wrenn declared, "the Civil Aeronautics Board and the President have by their actions shown that there is to be no monopoly in international air transportation CAB's past record in opposing and preventing monopoly by a single carrier warrants confidence that the Board can and will continue to carry out that policy"

In this case, the examiner observed "it is difficult to be impressed with charges that approval of PAA's acquisition of (AOA's) temporary certificate due to expire July 5, 1952 will result in a monopoly"

► **Charges Discounted**—Wrenn attached little importance to testimony regarding Pan American's alleged attempts to achieve monopoly by exclusionary tactics in bargaining with other governments by acquiring other airlines, and by eliminating competition through division of territory He said PAA may not have been gracious to its competitors but added that its attitude was not unusual The more sensational claims about PAA's alleged cut-throat tactics toward competitors have not been substantiated, Wrenn indicated

Charges by American Export Lines AOA's largest minority stockholder that American Airlines President C R Smith had committed a flagrant breach of trust used high-pressure methods engaged in stealthy negotiations and made false statements in negotiating the original AOA sale agreement with Pan American were discounted by Wrenn

► **Procedure Legal**—The examiner admitted it seemed "unusual" that Smith during early stages of the merger negotiations failed to consult with Ralph Damon then American Airlines president and John Slater AOA board chairman and representative of American Export's interests But Wrenn said Smith was under no legal obligation to do so

As long as all stockholders receive equal consideration from the sale, Smith committed no breach of trust in carrying out the wishes of AOA's majority stockholders in opposition to the wishes of the minority, the examiner's report declared It added that there was no proof of charges that Smith believed approval of the merger would kill PAA's chances for a domestic route and that Smith bargained for such a result

'Mr Smith's judgment (in conducting the negotiations) may have been bad, and he seems to have been in error as to some of his information, in which case he must answer to his directors and stockholders But," Wrenn continued "there is nothing to indicate that Smith knowingly or wilfully misrepresented matters."

► **Smith Attitude**—"It is clear that Smith concluded that American should terminate its interests in trans-Atlantic operations and believing his directors felt the same way, he set about doing so with his characteristic energy and methods American, the majority stockholder, is within its rights in concluding that its own operations require all its capital and its management's attention It is not obligated to strain its capacity to support its subsidiary"

Wrenn said that Smith and Trippe apparently engaged in arm's length bargaining on the AOA sale as required by CAB He added that the $17,450,000 price placed on AOA—the carrier's approximate book value as of June 30, 1949—appeared fair and reasonable, especially since it would be difficult to place an additional going-concern value on a company whose certificate expires in 1952

► **Pattern Analyzed**—Turning to arguments that the present three-carrier North Atlantic route pattern is fundamentally sound and should not be upset, Wrenn noted that considerable difference exists between the routes envisioned in CAB's decision in 1945 and the links the U S flag carriers have actually been able to operate

AOA has been unable to serve Poland Leningrad or its eastern terminal at Moscow The "Iron Curtain" also has barred PAA from flying its Central European route across Hungary, Yugoslavia Rumania and Bulgaria to Turkey

"Thus" Wrenn declared "instead of having a route in which duplication with PAA was incidental AOA found that in 1948 about 74 percent of its trans-Atlantic passengers were carried to and from points also served by Pan American It is clear that AOA does not serve a non-competitive area of sufficient importance to require its continuation as a separate operation."

► **Impact on TWA**—The examiner took note of varying opinions on how the PAA-AOA merger would affect TWA Smith and Trippe said elimination of one competitor (AOA) should help TWA's overseas business TWA replied that approval of the merger would result in a 10 percent diversion of its trans-Atlantic traffic giving PAA about 71 percent of the U S-flag total and TWA the remainder

Wrenn said PAA's traffic gain through the merger would be almost entirely from AOA since the only point common to TWA and American Overseas is Shannon, which PAA already serves. He asserted that most of the points which would be acquired by PAA are far from TWA's route.

TWA's trans-Atlantic traffic has shown healthy growth during 1948 and 1949, the report continued. TWA has certain basic advantages such as access to the Middle East oil territory and lack of extensive U. S. and foreign flag competition, and no part of its routes has been cut off by the presence of the Iron Curtain.

▶**Gloom Unwarranted**—These advantages, Wrenn declared, have not yet been reflected in TWA's traffic development and indicate that the company's future prospects are not as gloomy as pictured by its witnesses. "Probably the only (directly) beneficial result to TWA from this deal is that it enabled the carrier to obtain Mr. Damon, one of the most capable men in the industry, as president at a time when the company is approaching termination of its international certificate."

Noting PAA claims that the merger would strengthen U. S. international aviation against foreign competition and reduce subsidies, Wrenn warned that Pan American must make good on its arguments between now and 1952 if the merger is approved. PAA President Trippe said $9 million annually in mail pay savings were possible through the merger.

Maintenance Bonus Plan Pays Off

British European Airways offers incentive to ground crews; result is saving in time, manpower and money.

New maintenance methods and a bonus incentive basis of payment have helped push British European Airways Corp. into the black, at a time when other members of the British state airline combine are still showing financial losses.

BEA's basic philosophy on turning losses into profits was obvious—you increase your revenue and make economies in expenditures. And this meant careful budgetary control in all departments and a month-by-month watch to see that spending did not exceed a predetermined level.

▶**New Idea**—Then in November, 1948, Hugh Gordon, BEA's chief maintenance engineer, came up with a scheme that appeared to be singularly new in airline maintenance operation. It works like this:

A reasonable time is fixed for each maintenance job. Then, 30 percent of this figure is added to the time, and the total becomes the time allowable to complete the job. A man who completes the task in the specified time, or longer, is paid at the basic hourly rate for the whole time. There is no penalty if the job takes longer—but this is a rare occurrence.

If, however, the man completes the job in less than the allowed time, he is paid for the time consumed plus half the time saved. So he and the corporation share equally the saving.

▶**How It Works**—In actual practice, a job estimated to take 40 hr. becomes a 52-hr. allowable-time job after the 30 percent is added. If, for example, a worker completes the job in 30 hr., he is paid his hourly rate, times 30, plus his hourly rate times 11 (half the 22 hr. saved). So, for the worker the scheme means a higher rate of pay, providing management can keep constant work loads so that no men are idle.

As far as BEA is concerned, the by-product is more flying hours per aircraft, fewer lighting and heating hours. And weekend work has been virtually eliminated.

Figurewise, the bonus incentive system and certain simplifications in maintenance procedure have brought about considerable savings. On one specific maintenance check, BEA estimates it has made these gains:

- Men engaged on the job—June, 1948, 160; June, 1949, 52.
- Manhours to complete the job—June, 1948, 940; June, 1949, 270.
- Number of checks given—June, 1948, 32; June, 1949, 36.

In addition, BEA has been able to cut the size of its maintenance staff at Northolt—only base so far where the scheme has been installed—from 1140 men to 844 men.

Part of the saving in time and money can be attributed to the fact that the carrier's efficiency in maintenance procedure, even before the bonus system, was not as simple as it could have been. But, says BEA, even after making improvements, the bonus system accounted for the greatest part in the carrier's climb to the black.

▶**Quality Question**—One question always raised in connection with time-cutting procedures is whether the quality of the work is affected. BEA feels that the system itself makes for higher quality. A worker who has to go back and rework a job will lose money—that is, he can't get less than the basic rate, but he will fail to get the incentive bonus. And the system automatically weeds out the less skilled and more-idle workers.

One direct consequence of the system was the need for rate fixers and a number of extra clerks. Total required was 53 additional helpers, which cut personnel saving from 296 to 243—still a considerable manpower improvement.

▶**Disputes Few**—There has been little dispute over rate fixer decisions on time allowable to complete a job. Most of the rate-fixers are BEA men familiar with the work, and problems are usually settled on the ground floor level.

The incentive bonus system makes necessary the use of a worker's ordinary time card and a job order card as the two basic records in the shop. A job order card is given to the man at the beginning of the job and the foreman notes the time on it. The card carries details of the work to be done and shows the time allowed. When the job is completed, the worker writes the time on his job order card and also stamps the time on his ordinary time-card at the clock. At the same time he posts a "Request for Inspection" notice, which brings an inspector to the completed job. If a man feels he ought to have the benefit of inspection at any point in the progress of a job, he can call for it and allowance is made for time consumed in the process.

Use of the time card, as well as the job order card, is to provide a check on the times entered at each job completion. And employes who are kept waiting for work or materials are given a special card and paid a bonus rate.

Although Gordon's bonus-incentive system is operating only at BEA's Northolt base, chances are it will go into effect at the carrier's Renfrew base very shortly. BEA maintains Vickers Vikings at Northolt, at Renfrew the company performs maintenance on its Dakotas, which would make its figures available for comparison with costs to other airlines maintaining DC-3s.

UAL Buys DC-6Bs

United Air Lines has become the first commercial purchaser of Douglas Aircraft Co.'s new DC-6B transports.

UAL President W. A. Patterson said six of the planes have been ordered, with deliveries to start early in 1951. The DC-6Bs, costing over $900,000 each, will be in addition to five DC-6s ordered by United last August at a cost of about $866,000 each. When all deliveries are completed, UAL will have a total of 50 DC-6 type transports. (American Airlines is also evaluating the DC-6Bs and may order them for use in its transcontinental air coach service which started last month.)

Airline Operating Profits

(First 10 Months)

Carrier	1949	1948
American	$9,643,775	($2,348,601)
Braniff	476,936	580,462
Capital	1,190,579	(1,004,108)
Chicago & Southern	831,128	542,200
Colonial	307,399	124,415
Continental	(172,114)	265,380
Delta	628,513	1,042,991
Eastern	4,096,245	3,917,334
Inland	445,392	123,237
Mid-Continent	527,212	10,538
National*	356,398*	(1,695,817)*
Northeast	189,552	(793,842)
Northwest	379,290	(3,343,449)
TWA	2,564,660	(1,476,337)
United	5,972,169	(2,113,756)
Western	375,467	(1,144,433)
*Nine months only		
Parentheses indicate loss		
	$27,812,601	($7,313,786)

Airlines End Profitable Year

Carriers' net seen at $25 million, with American leading; 1948 total showed $7 million loss.

Despite an accident-induced trend toward red ink in November and December, the domestic airlines finished 1949 with a touch of uneasiness from unaccustomed wealth.

The 16 certificated domestic trunklines showed an operating profit of close to $28 million during the first ten months of 1949. In the same 1948 period they had an operating deficit exceeding $7 million.

With the help of large retroactive mail pay increases late in the year, the carriers finished 1948 with slightly more than $2 million operating profit. Even with the lower traffic level resulting from three fatal accidents between Nov. 1 and Dec. 12, the domestic trunklines' $28 million operating profit for the first 10 months of 1949 probably will not be trimmed below $25 million.

▶**American Is Tops**—American Airlines, with a $9,643,775 operating profit during the first ten months of 1949, will be the top money maker during the year. Other substantial profits for the period were United's $5,972,169, Eastern's $4,096,245, TWA's $2,564,660 and Capital's $1,190,579.

Although good profits for 1949 are assured, the carriers are worried that there will not be general recognition that the earnings bring them only part way out of the financial woods in which they were lost during 1946, 1947 and 1948. The domestic trunklines' net profit on gross sales for 1949 is unlikely to be more than 5 percent—no excessive earnings rate by any standard.

Even so, the profits are likely to bring demands for higher wages, reduced subsidies, increased airport fees and early imposition of charges for use of the federal airways. Half of the 16 trunklines are on a temporary mail pay basis, which means that the Civil Aeronautics Board can institute proceedings to recapture profits coming to more than about 7 percent on a company's investment.

▶**High Traffic Level**—Main reason for the excellent 1949 earnings—best in the industry's peacetime history—is the estimated 14 percent increase in revenue passenger miles flown. Despite the drop-off in business during November and December, the traffic level of many carriers was still above the same 1948 period.

Although United's revenue passenger mileage for November was more than 23 percent below October it was still 4 percent above November, 1948. TWA's November traffic was 23 percent under October's but up 3 percent over November, 1948.

By comparison, Capital Airlines, with its coach service one year old, showed a passenger traffic gain of over 25 percent in November, 1949, compared with November, 1948.

Traffic during the first two weeks of December was at a seasonally low level, with transcontinental trunklines operating at less than a 50 percent load factor—an unprofitable figure. Vacation business on the New York-Miami run was also slow to build up. Improvement was noted as the Christmas holidays approached.

NWA Takes Delivery On Final 377

Northwest Airlines has taken delivery on its tenth Stratocruiser and is the first airline to receive its full order of the double-deck Boeing transports.

Final NWA delivery was the 45th of a total of 55 Stratocruisers ordered by five commercial airline customers. Boeing expects to complete delivery on all its current orders early this year.

High Court Ducks Pilot Squabble

Nonunion members have won a partial court victory over the Air Line Pilots Assn. in a decision involving two of Capital Airlines' flight personnel.

The U. S. Supreme Court has refused to review, and thus left in effect, findings of the U. S. Court of Appeals establishing a new principle concerning the status of decisions made by a system board of adjustment. The Appeals Court held that nonmembers of a union may obtain judicial review of an adjustment board decision even though the board is set up under the Railway Labor Act and the union's contract makes the board's decisions "final and binding."

▶**Decision Explained**—The Appeals Court reasoned that a nonunion minority has a right to seek protection from the courts when it is being opposed by a union and lacks representation on the adjustment board composed of company union agents. On this basis, the court modified the adjustment board's decision.

The dispute involved two Capital co-pilots, Richard I. Edwards and James A. Young, who were let out by Capital in a reduction in force at the beginning of the war after they had been employed about a year. They served in the armed forces and were rehired in 1945.

Other pilots and the union protested when the airline gave them seniority credit going back to the date of their original employment and later promoted them to captains. The company had accepted the contention of the

two nonunion pilots that they were entitled to seniority credit for time in the armed services.

ALPA invoked the aid of a system board of adjustment composed of four members, two each from the company and the union. The board held that the two pilots were not employes of Capital when they entered the armed services and, therefore, their seniority should be established in relation to the day they were reemployed.

▶ **Courts Disagree**—The nonunion pilots then took their case to the U. S. District Court, which decided it had no right to intervene because "final and binding" decisions of the adjustment board were not subject to court review. The Court of Appeals decided otherwise, asserting that the courts are available to minority nonunion members who have no voice in an adjustment board's decision.

The Appeals Court then reviewed the merits of the board's findings. It agreed with the board on the first point: the pilots were not Capital employes when they entered the armed services, and thus had no seniority protection under the draft law. However, under a provision of the contract covering cases of reemployment, these pilots were found entitled to seniority for all time worked for Capital, including the period before they were released prior to the war.

Domestic Freight Traffic
(Ton-Miles)

Carrier	First 9 Mos. 1949	First 9 Mos. 1948
American	22,145,000	14,593,000
United	17,000,000	14,000,000
Slick	16,840,000	19,945,000
TWA	8,509,000	6,750,000
Flying Tigers	8,295,000	9,008,000
Totals	72,789,000	64,296,000

Air Freight Sets New High in '49

AA, UAL, Slick run one-two-three in beating previous mark by one-third. Freight charges become erratic.

Air freight, which has set new tonnage records every postwar year, hit another peak during 1949.

The 16 passenger-carrying domestic trunklines' 1949 freight ton-mileage is expected to total around 95 million—up a third over 1948. It is estimated that the three long-haul, all-cargo carriers which were certificated last summer—Slick Airways, The Flying Tiger Line and U. S. Airlines—handled another 35,140 million ton-miles of freight.

In 1949, for the first time in the postwar period, a regular passenger-carrying operator led the industry in freight traffic. During the first nine months of the year, American Airlines flew about 22,145,000 freight ton-miles. United Air Lines was in second spot for the period with 17 million freight ton-miles.

▶ **Slick Third**—Slick, the independent operator which hauled the largest freight tonnage in 1946, 1947 and 1948, shipped to third place in the first nine months of 1949 when it flew 16,840,000 ton-miles. TWA with 8,509,000 ton-miles and The Flying Tiger Line with 8,295,000 ton-miles in the first three quarters of 1949 rounded out the industry's "big five" freight carriers.

Even with the continued upswing in air freight traffic, it is doubtful that any of the scheduled operators are making money on it consistently. Passenger-carrying lines don't separate their freight expenses from other costs.

During the first nine months of 1949, the 16 domestic trunklines took in over a dollar from passenger traffic for every five cents derived from freight. Average freight revenue of 15.20 cents a ton-mile compares with about 70 cents a ton-mile for express, 60 cents a ton-mile for carrying passengers at the regular six-cents-a-mile fare; and 40 cents a ton-mile for flying coach passengers at four cents a mile fares.

▶ **Outlook Favorable**—Despite these figures, many industry executives still believe they can build up a profitable freight business generating as much revenue as passenger traffic. But they refuse to set a target date for this development.

The all-cargo lines, Slick, the Flying Tigers and U. S., are all burdened with heavy losses from freight operations during previous postwar years. Yet there are some signs of better times ahead.

Slick said it showed small profits on cargo services alone during August, September and October—the first three months following its certification. The Flying Tigers were also in the black during the summer and fall, but earnings came from maintenance and leasing of aircraft to nonscheduled passenger operators, not from cargo service.

▶ **Seek New Planes**—Both Slick and the Tigers would like to buy more economical equipment, such as the Douglas DC-6A. Like other cargo carriers, they also hope for continued reductions in ground-handling costs.

Slick plans to acquire a fleet of eight single-engine Noorduyn Norseman cargoplanes with a 2000 lb. payload to provide short-haul feeder service. The Noorduyns will bring San Diego and other southern California cities within 45 min. of Slick's main western terminal in Los Angeles, where there will be connections with the company's transcontinental C-46 flights.

November was the second best traffic month in Slick's history, with 2,600,000 freight ton-miles flown. An equally high volume was anticipated for December.

▶ **Rates Erratic**—Air freight charges which were quite steady in 1949 as a result of the Civil Aeronautics Board's minimum rate orders, took an erratic course at the close of the year.

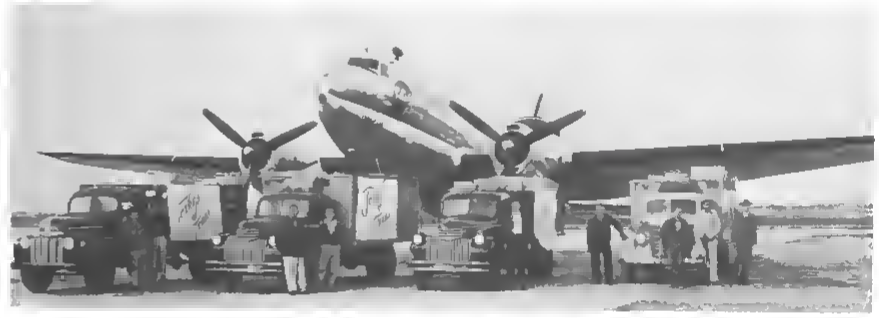
Specific and general commodity rates on the north-south run east of the Mississippi River are tending downward following CAB approval of new tariffs filed by U. S. Airlines. The situation is reversed on transcontinental routes, with American, TWA and United raising specific commodity rates about 10 percent in December and planning a similar hike in general commodity rates (especially on small packages under 50 lb.) on Jan. 1.

Eastern Air Lines strenuously objected to the lowered tariff proposed by U. S., asking that it be suspended pending investigation. CAB rejected the complaint.

EAL said U. S. was inviting a freight rate war by proposing charges averaging 17 cents a ton-mile when its operating expenses in the third quarter of 1949 were over 62 cents a ton-mile. U. S. replied that the new rates were designed to generate additional traffic and are the same or higher than transcontinental tariffs.

Following CAB's acceptance of U. S. Airline's rate reductions, Eastern, National and Delta Air Lines acted to make comparable cuts in some of their specific commodity tariffs.

TOP of the cargo list for the first time American Airlines, shown loading razor blades, flew over 22 million ton-miles. Time magazine became an **AIRFREIGHT** booster using United Air Lines to carry election issues.



CARRIERS have been developing markets in their own backyard. Slick Airways, for example, used four trucks to carry a one plane shipment on its "garment airlift," hauling ready-to-wear men's and women's clothing. Some carriers

IN a pinch, haul vital parts for other lines, as TWA is doing for Sabena. All in all, **1949** has been record year for airfreight, which has included even horse shipments, as this one by the Flying Tigers. The goal: as much freight as passengers.

Regulars Favored In U. S.-Alaska Bids

In a report striking at the roots of non-scheduled operations on the U S - Alaska route, Civil Aeronautics Board examiner William F Cusick has recommended that two certificated carriers be permitted to compete with Northwest Airlines for Seattle Anchorage traffic

Pacific Northern Airlines, which now operates scheduled service in Alaska as far south as Juneau, should be authorized to extend its links to Seattle for one year, the examiner stated He said that Pan American Airways, which is now certificated to fly from Seattle to Ketchikan, Juneau, Whitehorse, Fairbanks and Nome, should be permitted to operate a new link from Juneau to Anchorage for one year

▶**Nonsked Bids**—Cusick recommended denial of Alaska Airlines' application to operate from Fairbanks to Great Falls, Mont, the Twin Cities and Chicago, and from Anchorage and Kodiak to Seattle, Portland, San Francisco and Los Angeles

He also urged rejection of Mt McKinley Airways' bid for a certificate or exemption to fly between Anchorage and Seattle Based at Anchorage, Mt McKinley has been one of the principal nonscheduled operators on the U S - Alaska run

▶**In Public Interest**—The examiner indicated that it is CAB's duty to "guard jealously" the routes it has granted to certificated operators, and should make available to these scheduled carriers all traffic that would serve to improve their economic well being and lessen mail pay requirements He added that if irregular operators should suffer monetary loss when CAB carries out its responsibilities it must be considered a business hazard that should have been contemplated when the nonskeds started their ventures

"Thus," Cusick declared, "in a very real sense the traffic hauled by irregular and nonscheduled operators must be viewed as traffic which should be available to the certificated carriers if the public interest would thereby be served"

ICAO Jobs Open

International Civil Aviation Organization will accept applications until Jan 15 for four positions now open in its secretariat in Montreal

Positions and their starting salaries are: technical drafting expert, $7500, technical officer (communications), $5600, technical officer, manual sections, $5600 and supervisor, index unit, $3000 Application forms may be obtained from Executive Secretary, Air Coordinating Committee, rm 6835, Commerce Building, Washington 25, D C

SHORTLINES

▶**Air Transport Assn.**—Adopted a $335,000 budget for first half 1950 at its recent annual directors' meeting Figure is equal to actual expenditures in last half 1949, when the association operated at $30,000 less than its budget

All officers were reelected at the meeting, which also named Croil Hunter, Northwest Airlines president, J W Miller, Mid-Continent Airlines president, and R H Davis, Piedmont Airlines president, to the ATA board of directors

▶**Alaska Airlines**—Has received a CAB exemption to make five one-way flights from Everett, Wash, to Anchorage, Alaska, carrying 75 cows, pursuant to a contract with the Matanuska Valley Farmers Cooperative Assn

▶**American**—In cooperation with travel agents has started selling three-day "Skylark" "packaged" tours to New York City AA is offering enterprising teachers an opportunity to travel to Mexico free as tour leaders Any faculty member in the U S may organize a tour of ten or more students or instructors to take advantage of the educational group rate which is 20 percent under regular one way fares

▶**BOAC**—Will take delivery shortly on the first of its new fleet of 25 four-engine 40-passenger Handley-Page Hermes They will replace Solent flying boats now operated on the South and East African routes

▶**Canadian Pacific**—Reportedly is negotiating for additional de Havilland Comets for delivery after the first pair (now on order) are received late in 1951 or early 1952

▶**Cordova Air Service**—CAB has offered to increase the Alaskan carrier's temporary mail rate in view of the company's critical financial condition

▶**Capital**—President J H Carmichael during a Wright memorial day address at Kill Devil Hill, N C, compared the 93 scheduled airline passenger fatalities in 1949 with the 300 persons killed in hunting accidents in only two months of the year About 13 5 million airline passengers were carried domestically in 1949 Carmichael said that for the ten years from 1938 to 1948, the scheduled airlines flew 63 million passengers with a total of 641 fatalities—considerably fewer than the number of persons who will be killed in hunting accidents in 1949 alone

▶**Empire**—Has raised hourly wages five cents in a new contract with the IAM

▶**Nationwide Air Transport Service**—CAB has given the large irregular carrier an exemption to carry agrarian and industrial laborers between the U S and British West Indies until Mar 1, 1950. The Miami Springs, Fla., company has been handling this type traffic during most of the postwar period.

▶**Northeast**—Eugene L Vidal, NEA director, has been ordered by CAB to cease being concurrently a director of Metropolitan Aviation Corp The interlocking relationship has not received Board approval

▶**Northwest**—Company's new Stratocruiser liquor service on domestic flights features following prices Scotch (Haig & Haig Pinch Bottle or Johnny Walker Label) or Bourbon (Old Fitzgerald or Walker's Deluxe) with soda or ginger ale, $1, Martini or Manhattan cocktails, 75 cents, soft drinks, 25 cents

Seattle-Tacoma Airport has officially replaced the Twin Cities as NWA's base for international operations

▶**Resort Airlines**—The all-expense tour operator has completed a tie-in booking system with Capital Airlines

▶**TWA**—Will submit an employes' retirement program to stockholders at the company's annual meeting next May 2

▶**United**—Has formally filed with CAB its special five-cents-a mile tariffs for certain Chicago-Seattle and Los Angeles-Seattle DC-4 flights on which cargo will be cabin loaded Service will start Jan 16 if the Board approves . . More than 73 percent of nearly 5000 flights operated by UAL in November arrived at their destinations on time or within 15 minutes of schedule, a 17 percent improvement over 1948

CAB SCHEDULE

Jan 4—Hearing on transcontinental coach service. (Docket 3397 et al)

Jan 5—Oral argument on enforcement proceeding against Viking Airlines. (Docket 3447)

Jan. 9—Hearing in Florida Airways mail rate case. (Docket 3695)

Jan. 11—Prehearing conference on enforcement proceeding involving alleged unauthorized operations of National Travel Club, Inc. (Docket 4194)

Jan 16—Hearing on Nationwide Airlines' application for Michigan routes (Docket 2832)

Jan 16—Hearing in New York area helicopter case. (Docket 940 et al)

Jan 17—Hearing in National Airlines route transfer case (Docket 3560)

Jan. 23—Hearing on air freight accumulation, assembly and distribution tariffs (Docket 1708 et al)

Jan 23—Hearing on Cuba-Florida foreign air carrier permit case. (Docket 2717 et al)

Jan 23—Hearing on enforcement proceeding against New England Air Express. (Docket 4151)

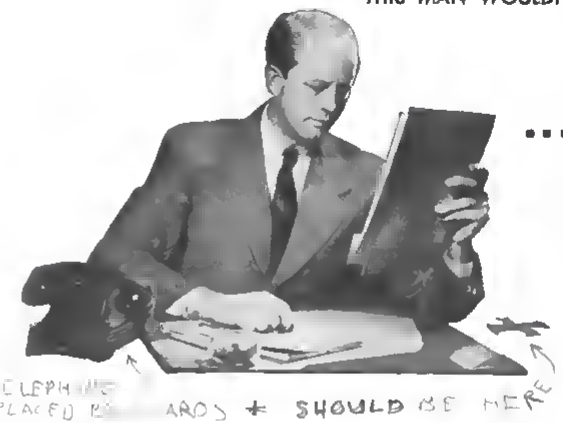
Feb 6—Hearing in Colonial Airlines mail rate case. (Docket 2724)

Feb. 13—Hearing in West Coast Airlines' certificate renewal case. (Docket 3866)

Feb 24—Hearing on CAB's enforcement action against Matsor Air Transport. (Docket 4198)

THIS MAN WOULDN'T NEGLECT

A MACHINE IN HIS PLANT



...yet he hasn't had a Chest X-Ray!

He checks every piece of mechanical equipment he owns for wear, lubrication, efficiency.

Yet he fails to take the simple precaution of a Chest X-Ray to make sure he does not have tuberculosis. *Not because he's opposed to the X-Ray. Simply because he is not sufficiently informed—or just hasn't taken the time and trouble, or does not realize the seriousness of the problem.*

A Chest X-Ray is the first step toward detecting tuberculosis in its early stages And in its early stages it can be cured with the least loss of time from work.

So, if you're the man above, that one simple reason should make you get your Chest X-Ray—*today.* But listen, see how serious this really is:

Between the ages of 15 and 34, tuberculosis leads all other diseases as a cause of death—although at no age are you safe from TB. Yet, if everyone does his part by getting a Chest X-Ray periodically, and the majority of cases thus discovered are followed up, we can eliminate TB entirely as a public health hazard!

Will you do your part today? Get a Chest X-Ray. It may mean your life!

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YOU GET IT EVEN WITHOUT NICKELS—AOPA's **Max Karant** had been flying a Piper Clipper in omni tests the other day at Patuxent NAS but was finally headed back toward Washington. "I was doing some cross-checking on both the Patuxent and the Baltimore omni stations and had just tuned to the Baltimore station, setting up its omni track for Washington, when I suddenly heard something decidedly different from the customary code identification BAL. Sure enough, music. Guess what? 'Mule Train.' Now, we've got the electronic geniuses in Washington in a mild tizzy explaining it."

* * *

TODAY'S GOOSE STORY—Friend **Fran Dunn**, who sees to it that Bell Aircraft does or doesn't get into the papers, depending on the occasion, claims **Glenn King** of Lawton, Okla., had this true experience. King was superintending his Air Force Bell H-13B copter, which was about 50 feet off the ground, circling a creek. Suddenly a flock of geese took off from the water and formed a perfect V behind the copter. For six or seven miles the astonished Glenn was lead goose. "Suddenly, as though they had just discovered they were being led on a wild goose chase by an intruder, the geese peeled off and left the 'lead man' in the air without an escort."

* * *

NAVY PRAYER, REVISED—Several loyal contributors from Washington and **W. E. Gasich** of Santa Monica have sent us the latest reverberation of the Air Force-Navy Controversy.

NAVY PRAYER

Our Father, Who art in Washington,
Truman be Thy name.
Thy Navy's done—the Air Force won,
On the Atlantic as in the Pacific.
Give us this day our appropriations
And forgive us our accusations,
As we forgive our accusers.
And lead us not into temptation,
But deliver us from Matthews and Johnson
For thine is the power, and the B-36,
And the Air Force for ever and ever.
Amen!

* * *

WATCH THOSE FEATHERS—Both **Ray Thompson** and **Jerry Lederer** relate this story by American pilot **Phil Beckman**. A few days after the Dallas crash Phil was back in the cabin on one of his public relations trips talking to the passengers. An old lady remarked that it had been a shame the ill-fated plane had hit a flock of birds on its approach. Phil, surprised, asked where she had learned about this. "Why," came the answer, "it was in all the papers. The plane was coming in with one engine feathered." Looks like another interpretative reporting job for members of the Aviation Writers Assn.

* * *

WATCH YOUR MENOMINEES—Our Beaver Dam (Wis.) correspondent, **Bert Reichert**, says if you intend to take a Wisconsin Central plane you'd better be sure you're headed for the right town. WCA began scheduled air service to Menominee, Mich., Dec. 1. On the third flight, four passengers got off. But three caught the next plane out again. It seems that two of them really wanted to go to Menominee, Wis., and the other thought he was headed for Menomonee Falls, also in Wisconsin. The ticket agents on the line now have instructions to ask passengers to make certain where they're going when they ask for a flight to Menominee.

* * *

FLIGHT CHARACTERISTICS OF A BRICK—Our Alex McSurely in Washington discovered the other day the CAA's well known engineer, **Harold Hoekstra**, has been exercising his slide rule in his spare time and claims these characters who talk about the wingloading of a brick don't apparently know what he knows. Actually, says Harold, a brick has about the same wingloading as a DC-3 and considerably less than many newer planes. Hoekstra's calculations show that a good average well-designed brick (3⅓ by 5), weighing about five pounds, has a wing loading of 25 pounds per square foot.

Furthermore, Harold swears, a barn door actually will fly well from a wing loading standpoint, if anybody wants to try it. The Hoekstra slide rule indicates that a 10 by 10 barn door can carry a complete DC-3 engine, nacelle, etc., and pilot, with about 25-pound loading.

—R. H. W.

WHAT'S NEW

Trade Literature

"AN Screw and Nut Catalog no. 75E" is 24-page illustrated bulletin stated to give complete listing, descriptions and prices of screws and nuts made to Army-Navy aeronautical standards. Compiled from certified specification lists. Available on request from Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago 50, Ill.

"Handbook for Paint Spraying" is 24-page booklet designed as an aid in selecting and maintaining sprayers. Provided are tips on sprayers, compressors, guns, and nozzles. There is a table of trouble shooting steps for diagnosing common failures. Available from The Electric Sprayit Co., Sheboygan, Wis.

Bulletin by Philadelphia division of Yale & Towne Mfg. Co. instructs on safe operation of gasoline fork trucks. With illustrations. Copies can be had by writing company at Roosevelt & Haldeman Ave., Philadelphia 15, Pa., for Bulletin P1170.

Charts give engineering data, and specs for use of Waldes Truarc inverted retaining rings (internal type 5008) with seal and shield bearings. Covered are Fafnir, Federal, Hoover, New Departure, and MRC seal and shield bearings. Write Waldes Kohinoor, Inc., Long Island City 1, N. Y., dept. TR58.

Folder, illustrating record control system effective in administration of preventative maintenance of machines and equipment, has been issued by Systems division of Remington Rand, Inc. Write company in care of Systems and Methods Research Dept., 315 Fourth Ave., New York 10, N. Y.

Catalog of Kollsman aircraft instruments is designed as reference hand book for engineers and technicians, giving application, operation, and performance of instruments together with installation instructions and diagrams. Instrument type listings are included for convenience of purchasing agents. Index tabs are used for speedy referencing. Write Kollsman Instrument division of Square D Co., 80-08 45 Ave., Elmhurst, N. Y.

"Cutting Production Costs With Electronic Controls" is booklet giving case studies of industrial control problems solved by means of electronics. Write Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.

Booklet describes New Departure ball bearings designed for belt and trolley conveyors, foundry mold car wheels, and similar applications. Write New Departure division General Motors Corp., Bristol, Conn.

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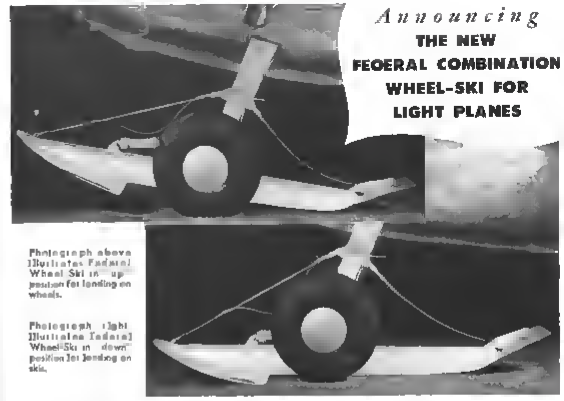

Photograph above illustrates Federal Wheel-Ski in up position for landing on wheels.

Photograph right illustrates Federal Wheel-Ski in down position for landing on skis.

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EDITORIAL

From Luxury to Utility

Straw in the Wind Department

American Airlines bought 50 modern Douglas DC-6s. Only six out of the 50 were special luxury versions equipped with berths.

Now, American has launched its transcontinental tri-coach service and has advertised for bids to convert three of its fleet of 50 to air coaches.

American has decided that all three planes to be converted will be selected from the half dozen luxury sleepers.

From luxury to utility.

Other major airlines that persist in concentrating on "luxury" for the few instead of utility for the many will wind up with the other also-rans in U. S. business history.

Luxury is all right in its place. But it alone will never support a transcontinental airline's passenger department again.

Give the Fixed-Baser a Chance

There is real merit in suggestions that scheduled airlines use the services of fixed base operators in smaller cities.

Joseph Garside, president of E. W. Wiggins Airways of Boston, is the spokesman for those who would bring members of the Air Transport Assn. and the National Aviation Trades Assn. into agreement on an experimental program of cooperation.

Fixed base operators' ground handling facilities have been stressed so far. But there would seem to be no insurmountable difficulty in certain ticket and cargo sales agreements and in offering airline passengers special charter air services to offline points.

The airlines have been accused, justly, of ignoring the independent fixed-base operator, while at the same time protesting to CAB and Congress about the excessive pay rolls they must maintain at small stations.

The fixed-base operator is already on the scene. He has experience and know-how. As long as he is able to keep booting the wolf away from the door he will have at least a nucleus staff on duty during the daylight hours. He will be glad to hire anyone else he needs. And if any class of business man has learned how to cut costs and operate on a minimum budget, it is the thrifty fixed base operator.

Furthermore, his is a home owned, well established business which can enhance the reputation of the airlines he serves.

As experiments in the Midwest by Mid-Continent Airlines seem to indicate, the fixed base operator can function as a sales agency and a business getter for the airline as well as his own air service, which will continue to serve the community as it has in the past.

If the airlines honestly mean what they say about wanting to cut station costs and energize hometown ticket and cargo sales, they should give the local operator a chance to show what his experience and energy can do for scheduled air transportation.

Death and Headlines

In mid-December when he delivered his Wright memorial day address at Kitty Hawk, J. H. Carmichael reported that the year's accident death toll on the domestic scheduled airlines had reached 94 persons among 13½ million air travelers, who had flown some six and a half billion miles in 1950.

This is too many deaths, the industry will continue to strive for what will probably always be unattainable perfection: a death-free record. And well it should. For we Americans have come to expect highest standards of safety in public transportation.

But it may surprise many of us, as it did the audience of Capital Airlines' president at Kitty Hawk, to learn that there were about 300 persons who were killed in hunting accidents alone in two recent months. No great headlines flashed this total from coast to coast.

"In the past 10 years, from 1938 to 1948, the scheduled airlines have carried 63 million passengers with a total of 637 fatalities. This ten-year figure is less than the number of persons who will be killed in hunting accidents this year alone."

The National Safety Council reports there were 15,200 passenger fatalities in auto and taxi accidents in 1948. Sometime this year someone will be the millionth motorist to be killed in an auto accident. And someone else, Slim Carmichael pointed out, will be the 30,000,000th person to be injured in a car.

There were more than 35,000 fatal accidents in the homes of the United States last year.

"Stones of traffic accidents and home fatalities merit slight notice in the papers. But when an airline accident occurs, the story rates headlines in the press and radio throughout the country. It's a dramatic story, capturing reader interest, and I believe that an editor would be remiss in burying such a story within the paper," this airline president said, only a short time after one of his own transports had fallen into the Potomac River with loss of life.

"However, a reader must exercise judicious analysis in his attitude toward such stories."

Aviation is a stern taskmaster; its public appeal is as great a liability after an accident as it is an asset during safe operations. Perhaps because of that very liability, aviation ultimately will become the safest of all means of transportation.

—ROBERT H. WOOD

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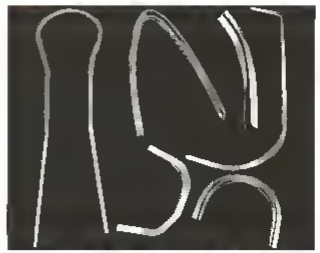

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